US010987944B2

(12) **United States Patent**
**Ota et al.**

(10) **Patent No.: US 10,987,944 B2**
(45) **Date of Patent: Apr. 27, 2021**

(54) **TRAY AND PRINTING APPARATUS**

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( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/526,622**

(22) Filed: **Jul. 30, 2019**

(65) **Prior Publication Data**

US 2020/0039242 A1 Feb. 6, 2020

(30) **Foreign Application Priority Data**

Aug. 1, 2018 (JP) ..... JP2018-145042

(51) **Int. Cl.**
***B41J 3/407*** (2006.01)
***B41J 13/14*** (2006.01)

(52) **U.S. Cl.**
CPC ..... ***B41J 3/4071*** (2013.01); ***B41J 13/14*** (2013.01); *B41P 2217/55* (2013.01)

(58) **Field of Classification Search**
CPC ..... B41J 3/4071; B41J 13/14; B41J 11/13; B41J 2/01; B41J 3/4073; B41J 13/0009; B41P 2217/55
See application file for complete search history.

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(57) **ABSTRACT**

A tray is used in a printing apparatus that includes a conveying unit configured to convey the tray holding a printing medium, and a printing unit configured to perform printing onto a print surface of the printing medium held by the tray. The tray includes a placement surface on which a printing medium is to be placed, a pressing member that presses the printing medium placed on the placement surface towards a downstream side of an inserting direction of the tray with respect to the printing apparatus, and a regulating portion configured to regulate a movement of the printing medium by abutting the printing medium pressed by the pressing member.

**20 Claims, 11 Drawing Sheets**

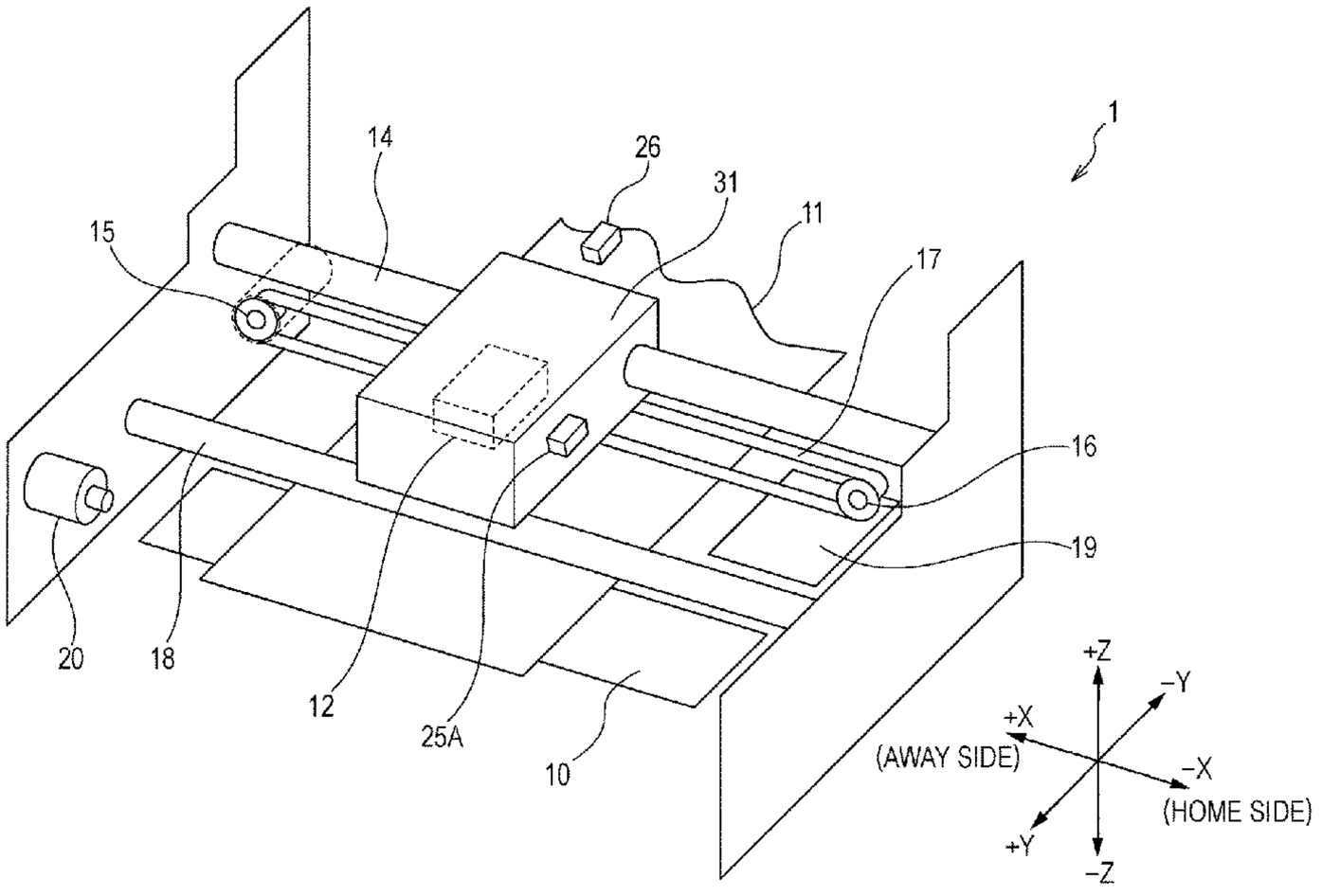

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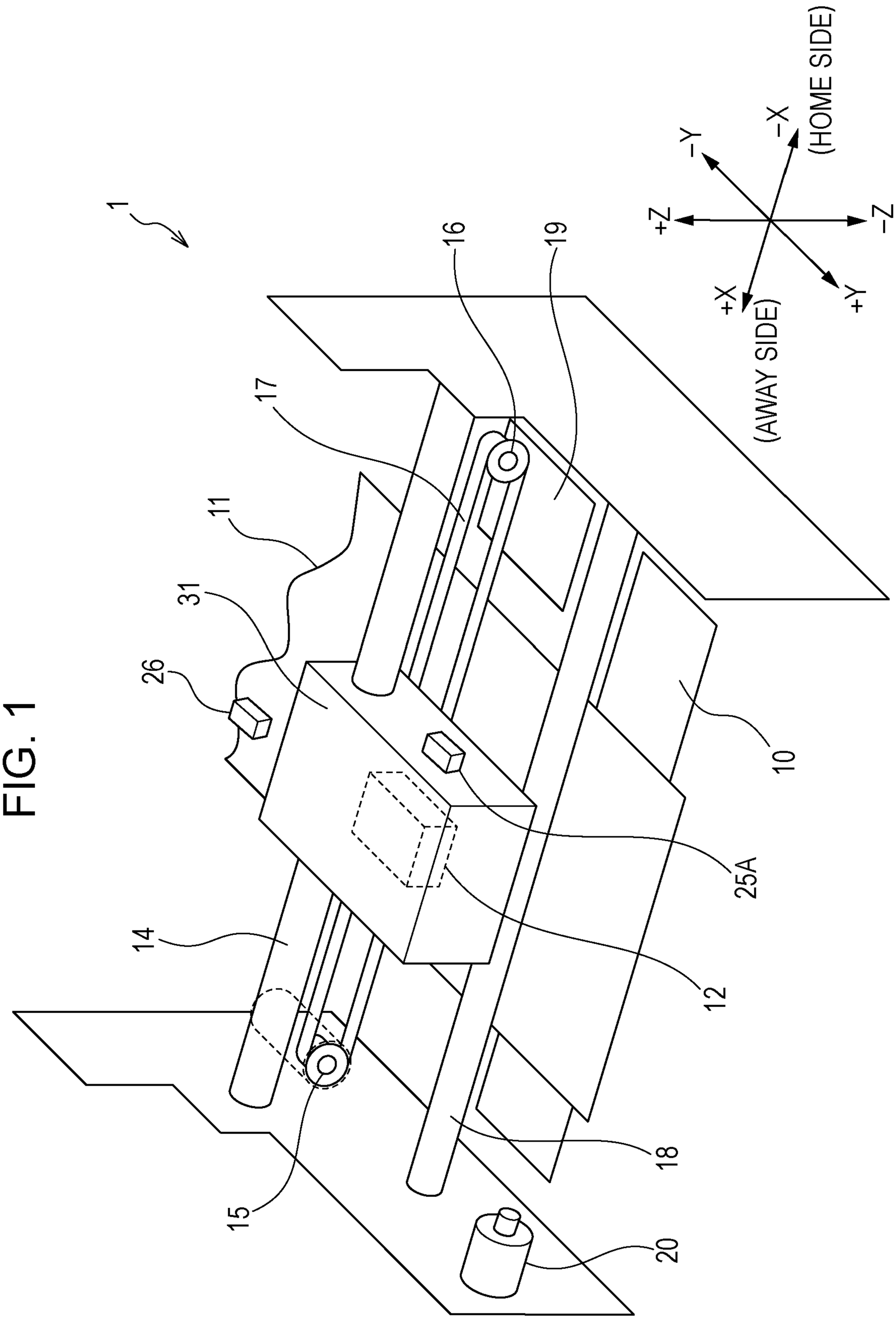
FIG. 1


1
16
19
17
11
31
26
14
15
18
20
12
25A
10
(AWAY SIDE)
(HOME SIDE)
+Z
-Z
+X
-X
+Y
-Y

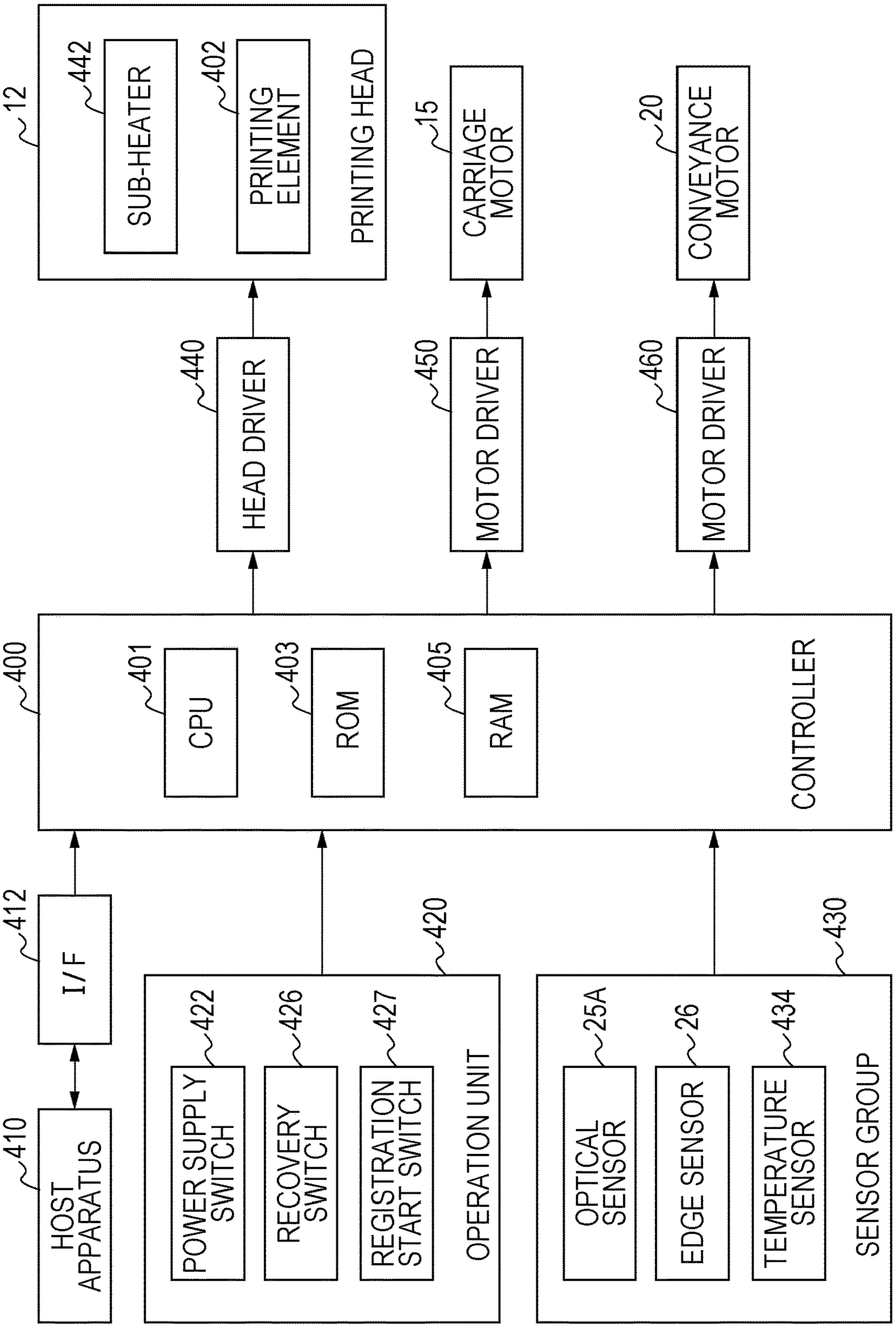

12
442
SUB-HEATER
402
PRINTING ELEMENT
PRINTING HEAD
15
CARRIAGE MOTOR
20
CONVEYANCE MOTOR
440
HEAD DRIVER
450
MOTOR DRIVER
460
MOTOR DRIVER
400
401
CPU
403
ROM
405
RAM
CONTROLLER
412
I/F
420
430
410
HOST APPARATUS
POWER SUPPLY SWITCH
422
RECOVERY SWITCH
426
REGISTRATION START SWITCH
427
OPERATION UNIT
OPTICAL SENSOR
25A
EDGE SENSOR
26
TEMPERATURE SENSOR
434
SENSOR GROUP

FIG. 2

FIG. 3

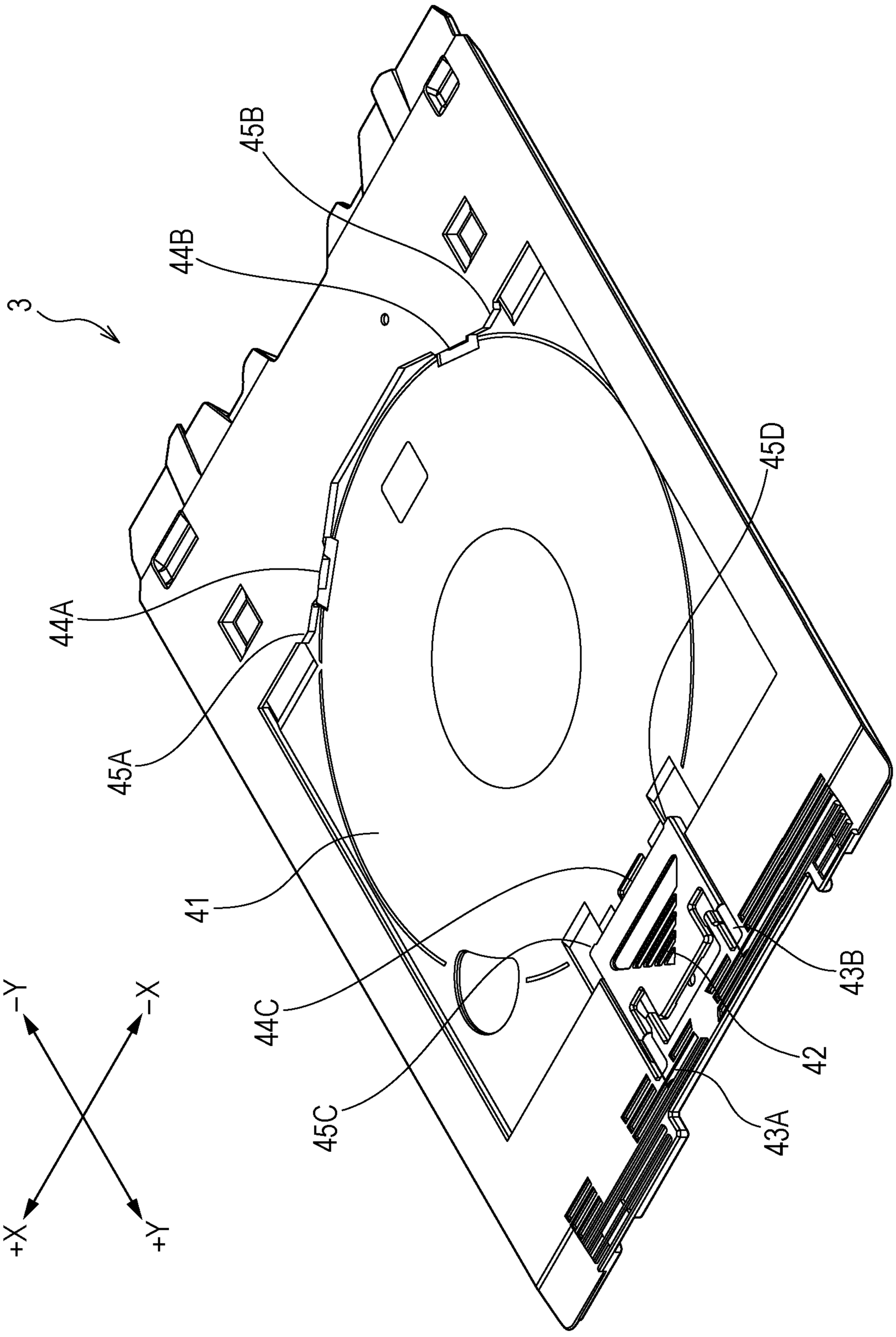


FIG. 4A

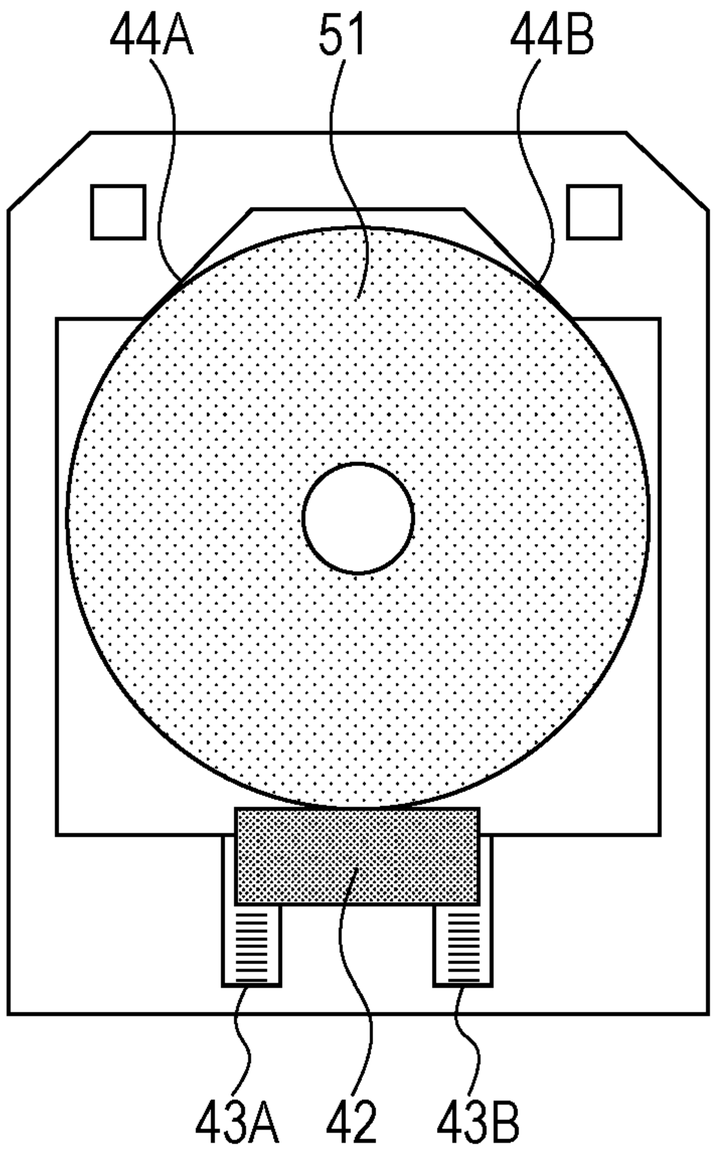



FIG. 4B

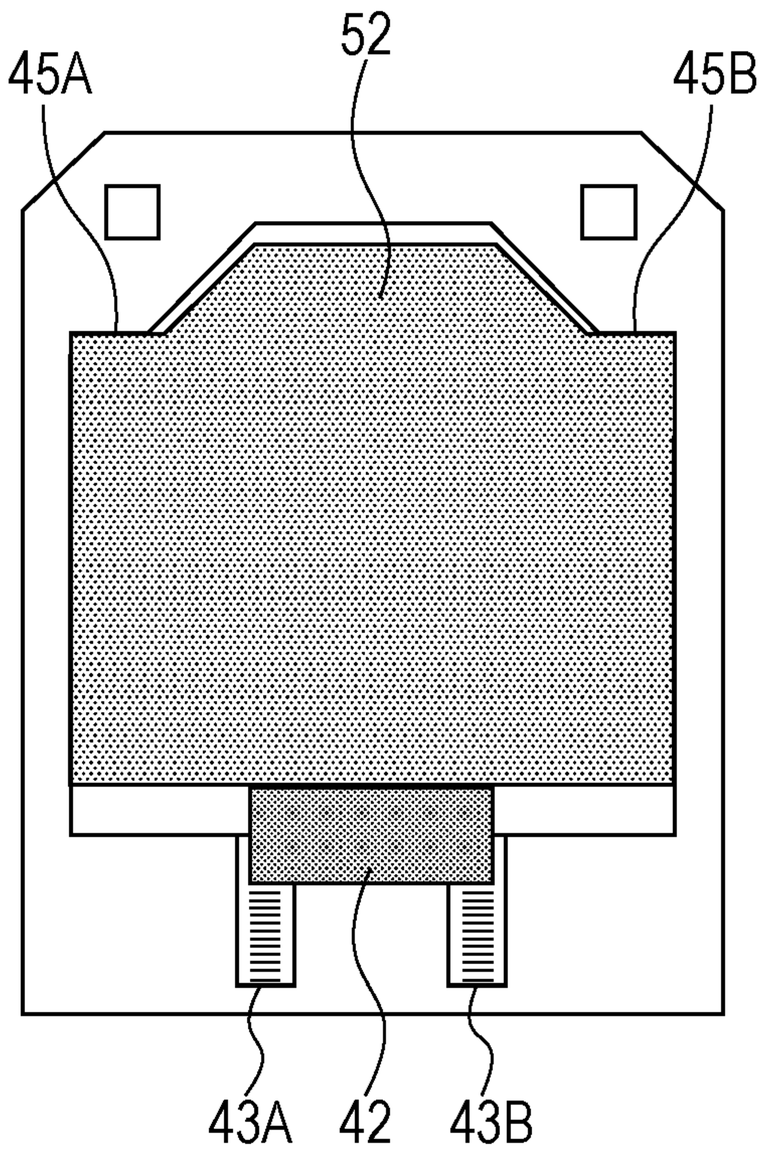



FIG. 4C

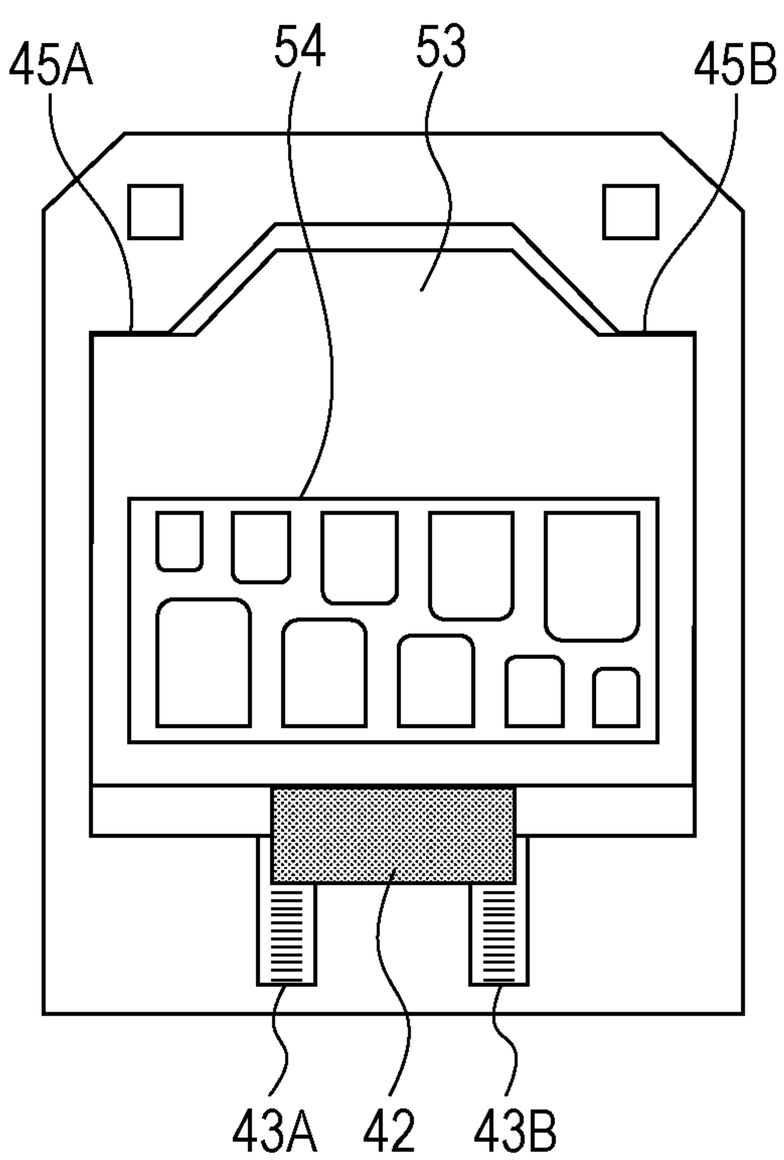



FIG. 4D

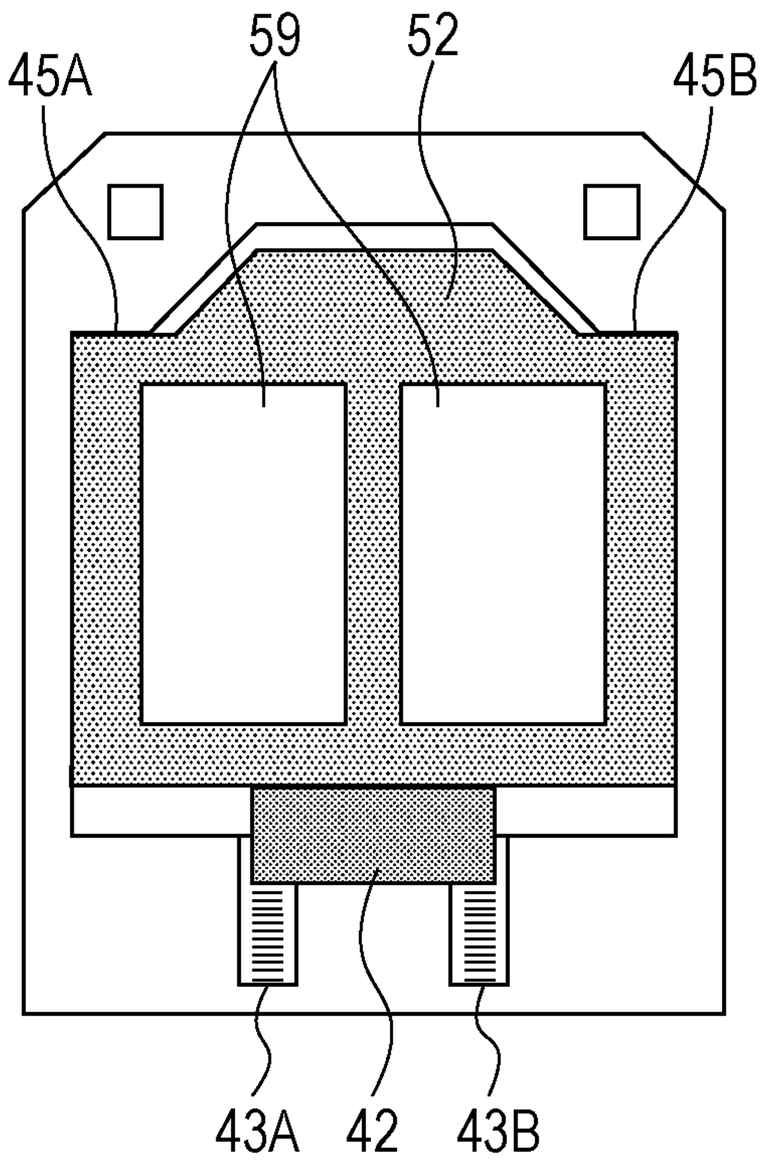


FIG. 5

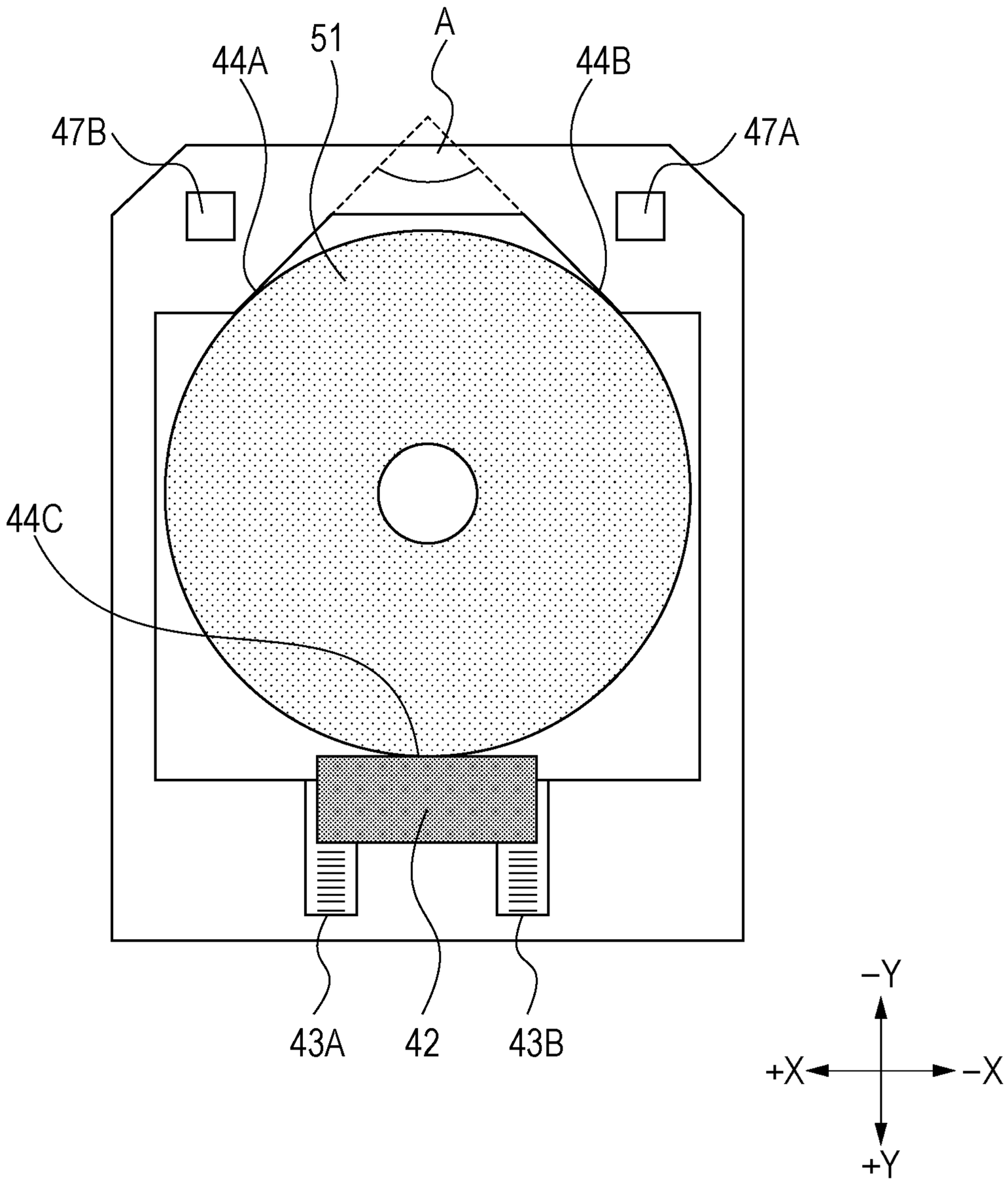
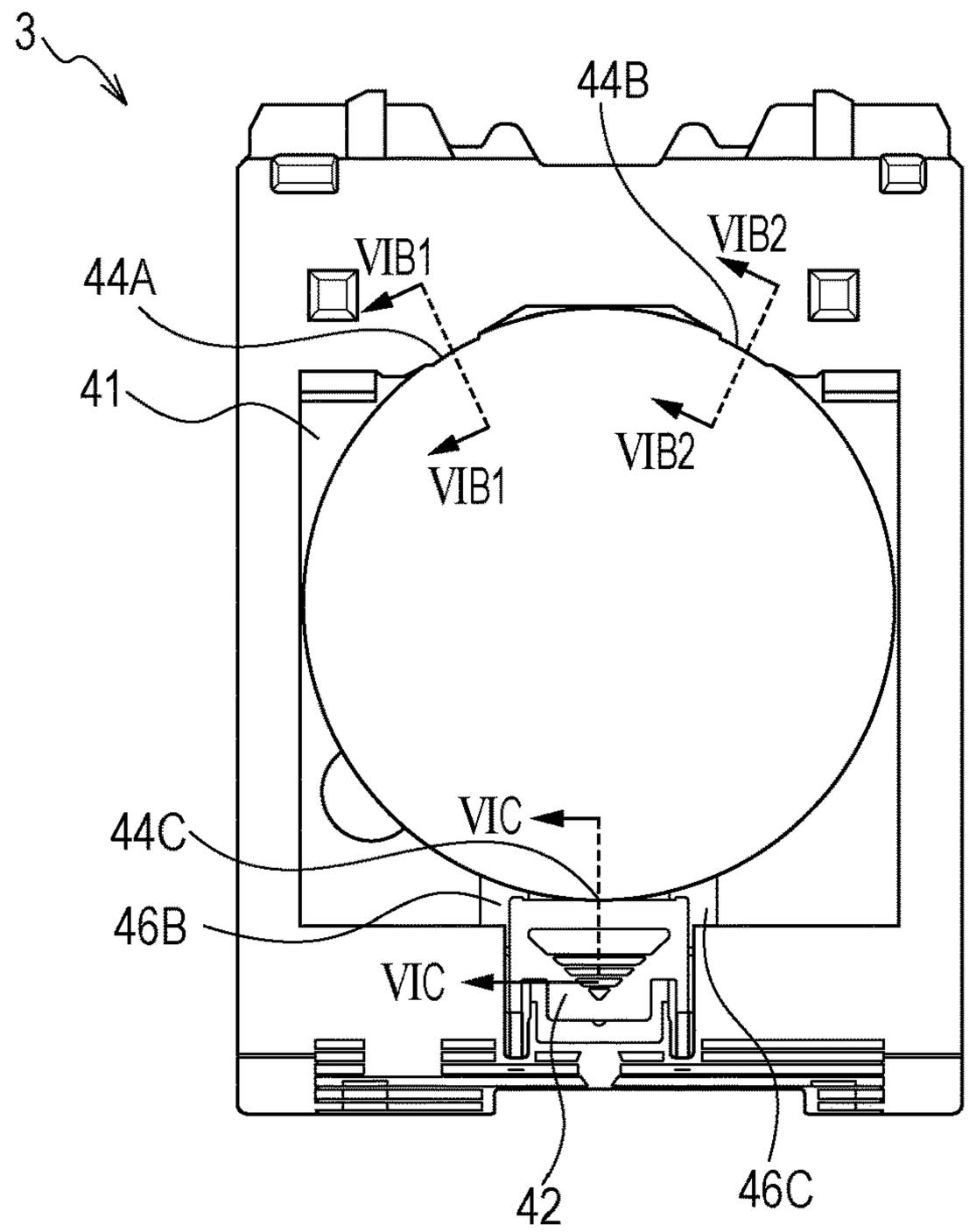


FIG. 6A



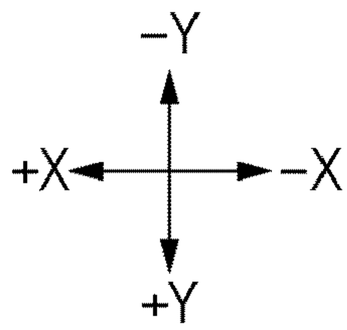




FIG. 6B

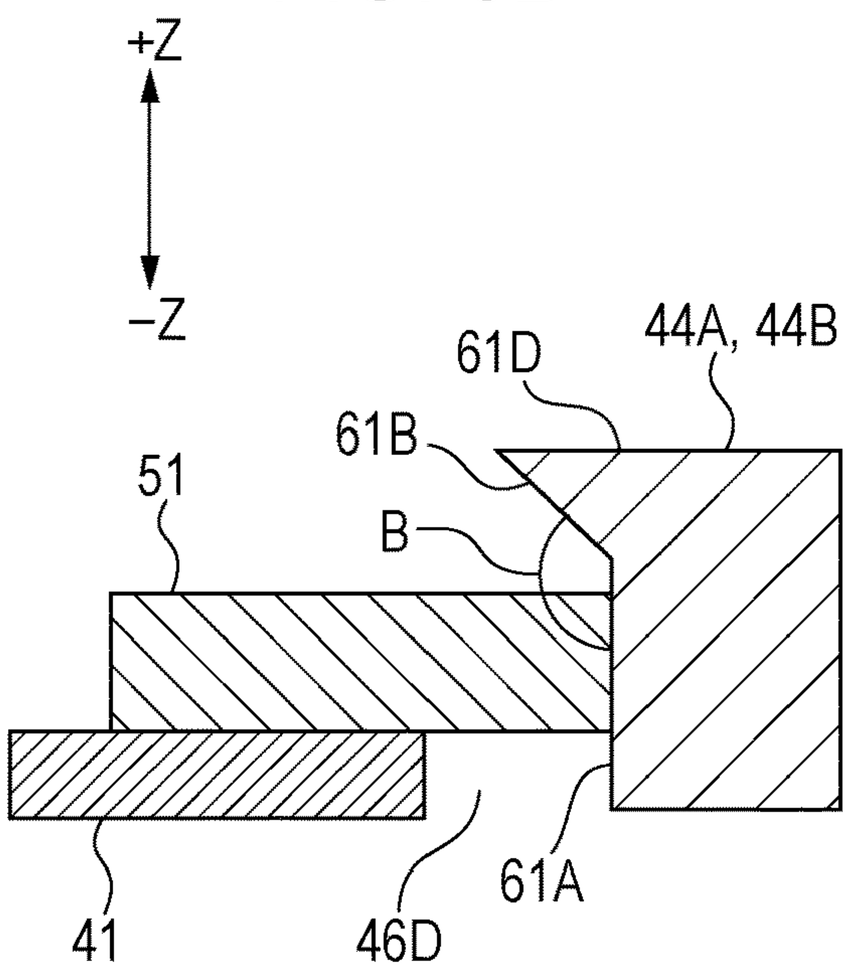
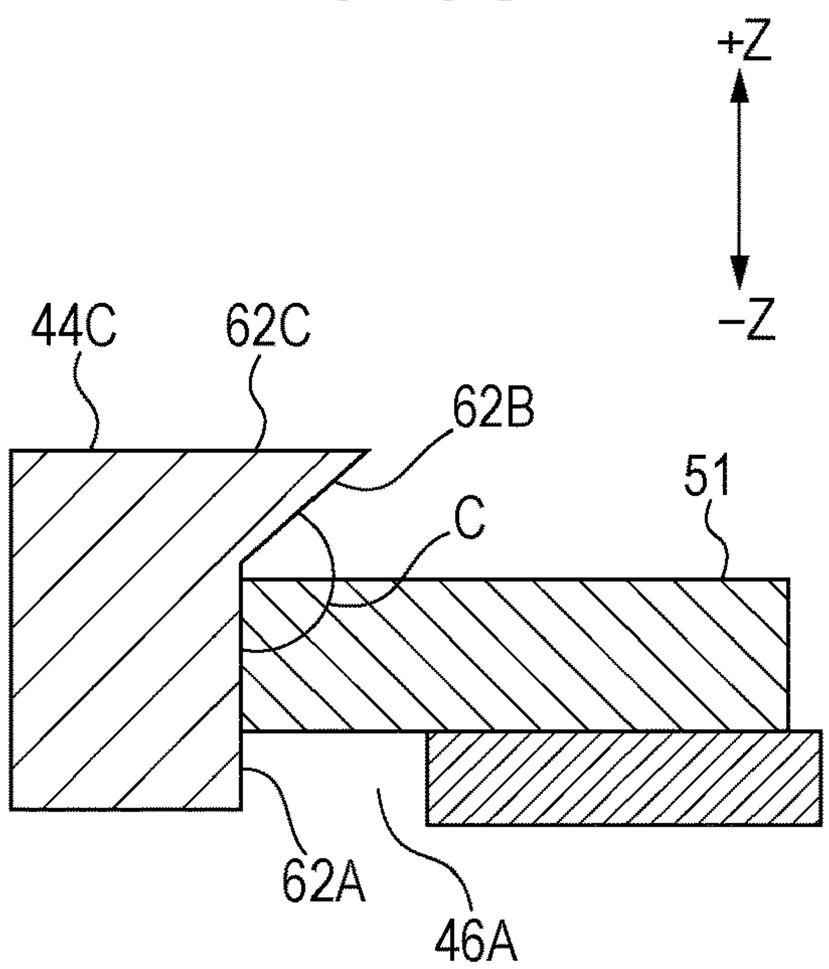



FIG. 6C



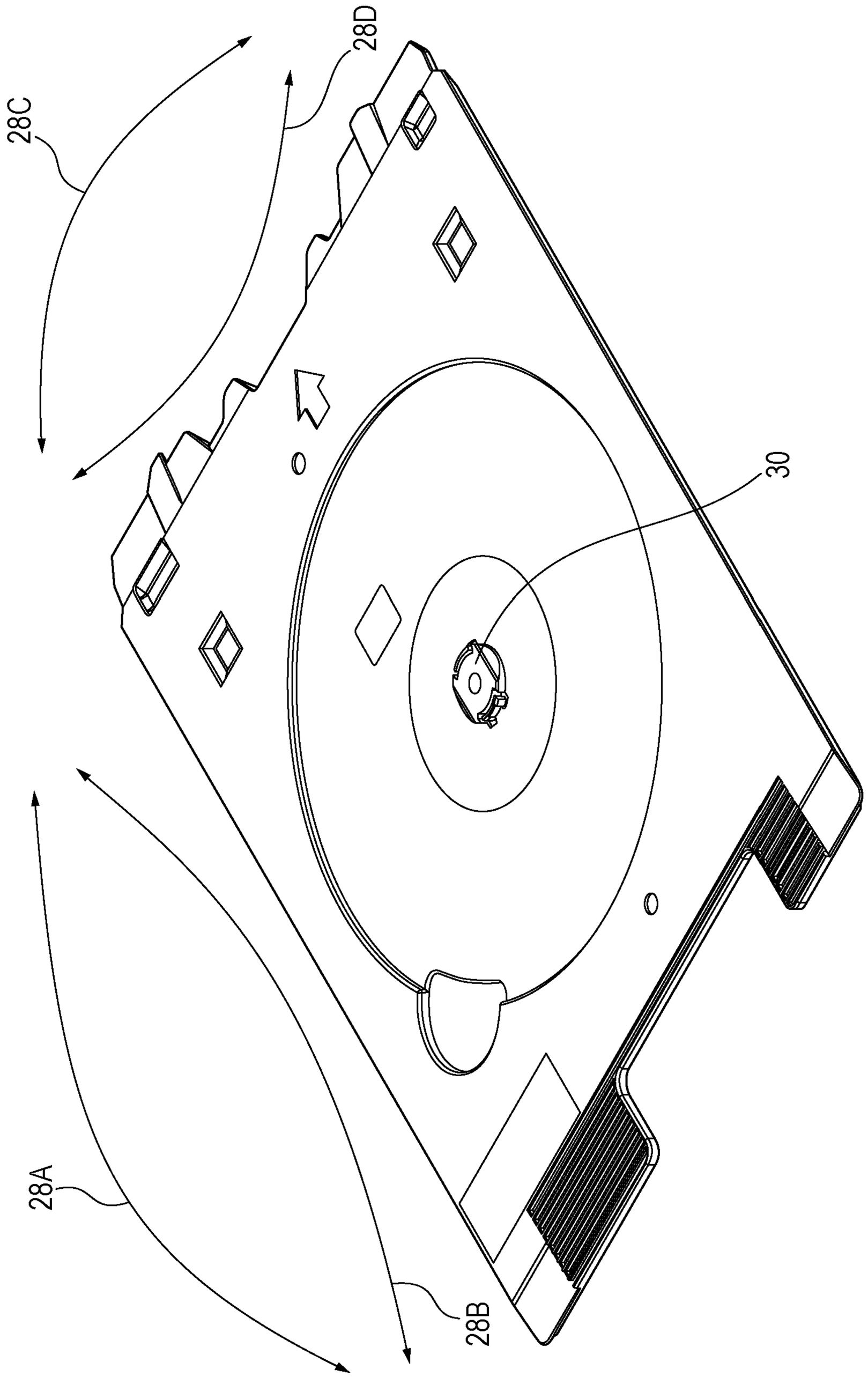



FIG. 7

FIG. 8

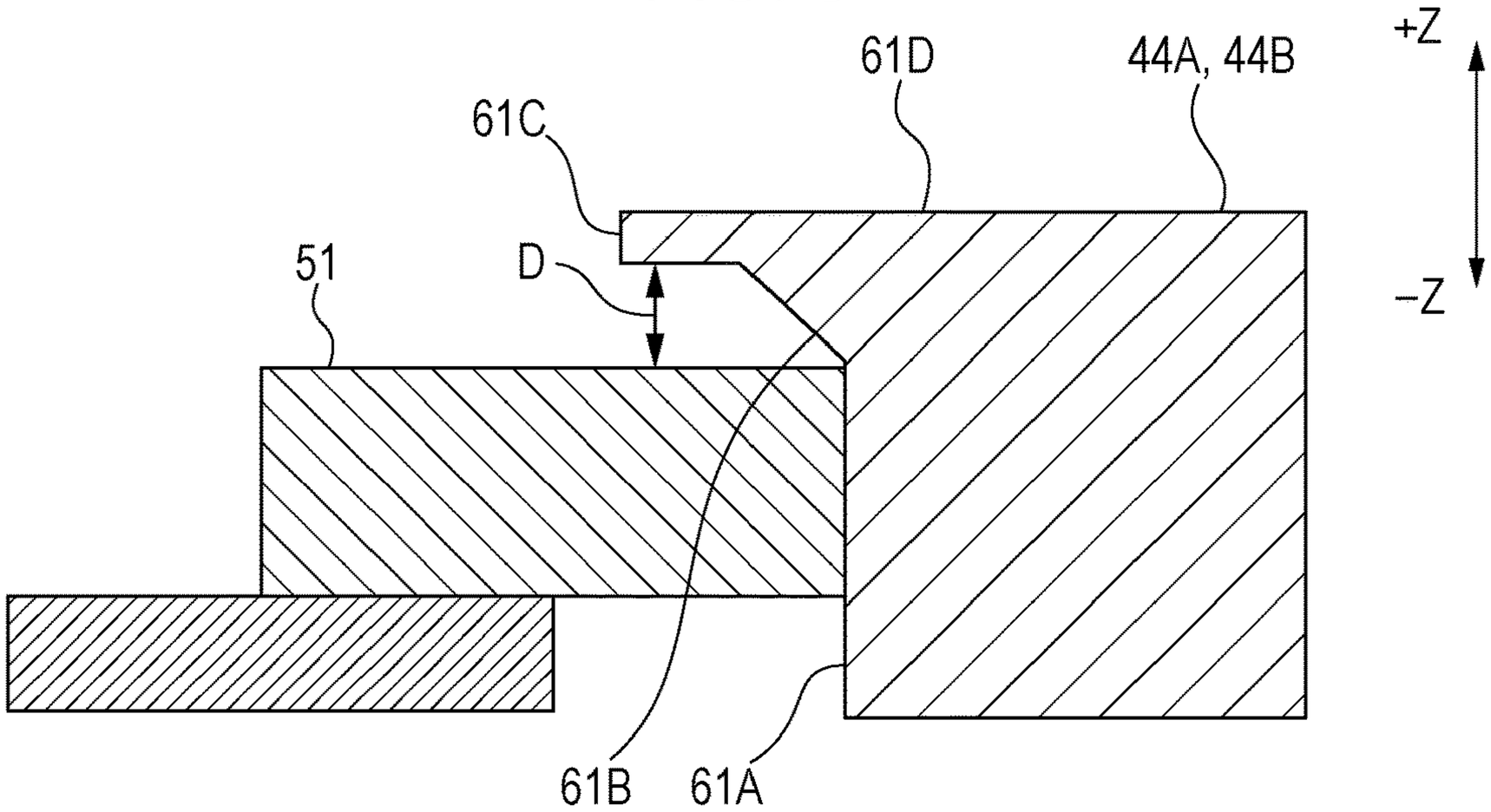



FIG. 9

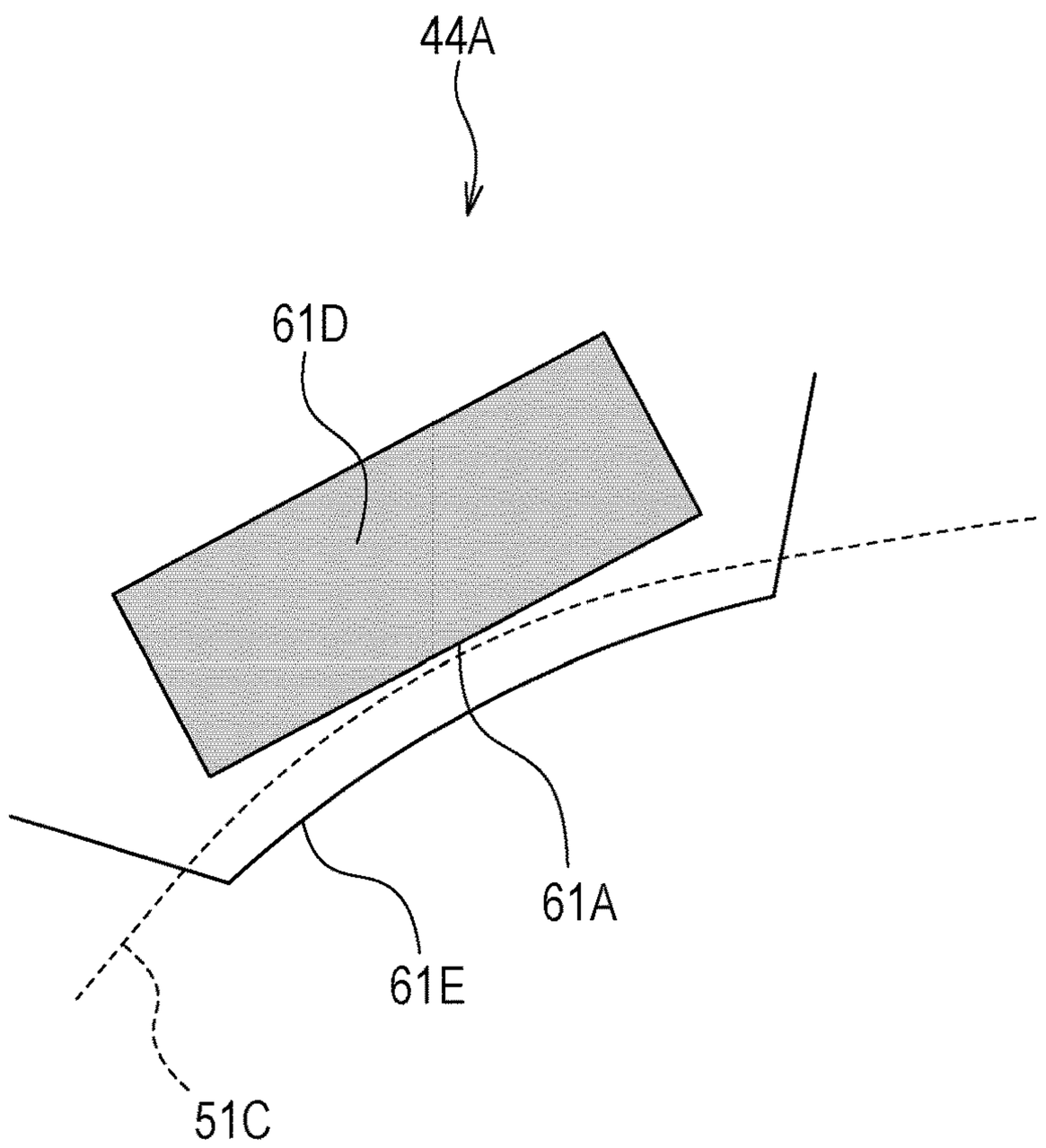


FIG. 10A

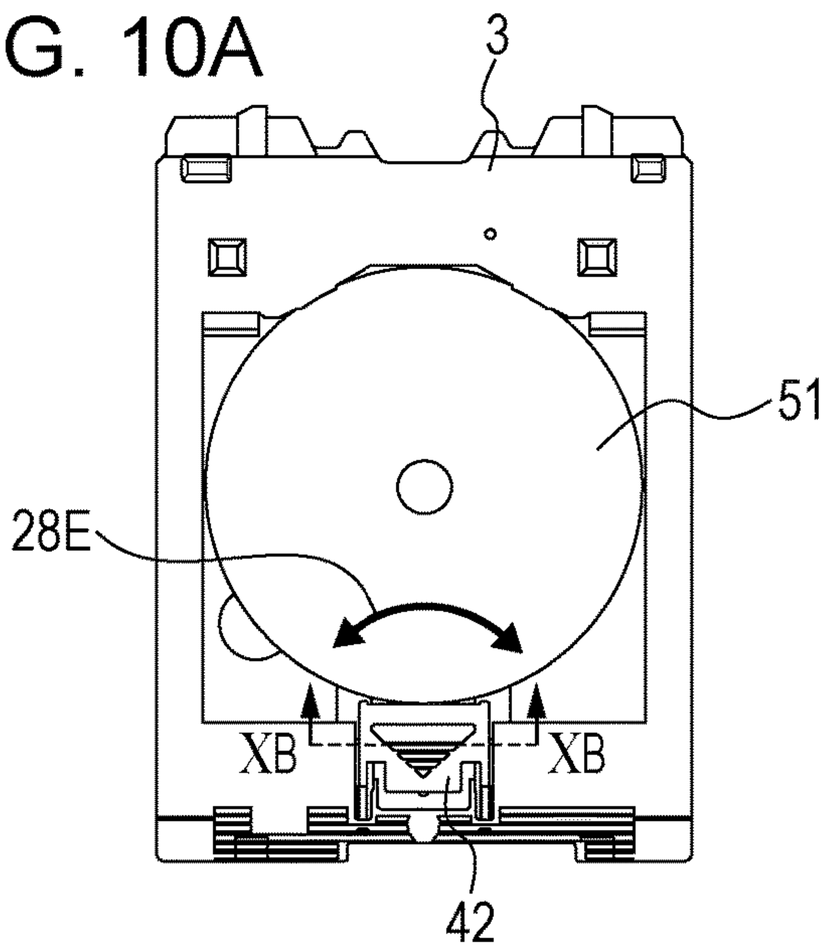



FIG. 10B

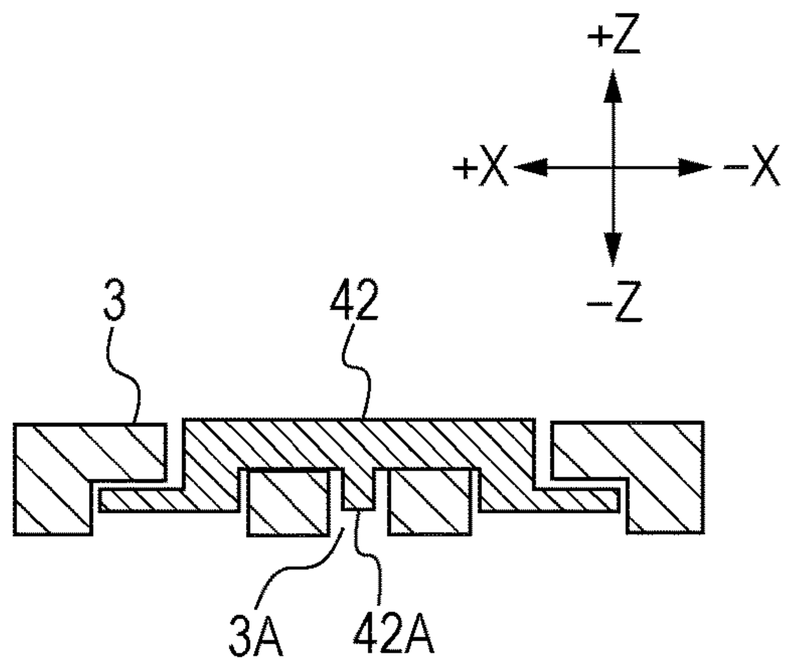



FIG. 10C

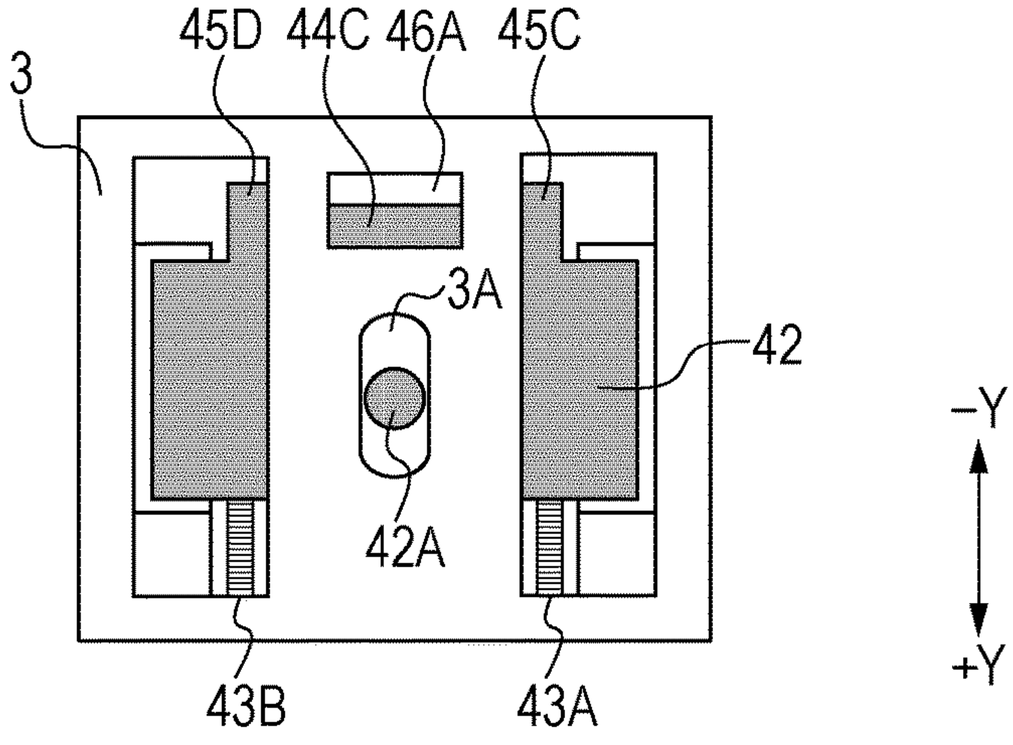



FIG. 10D

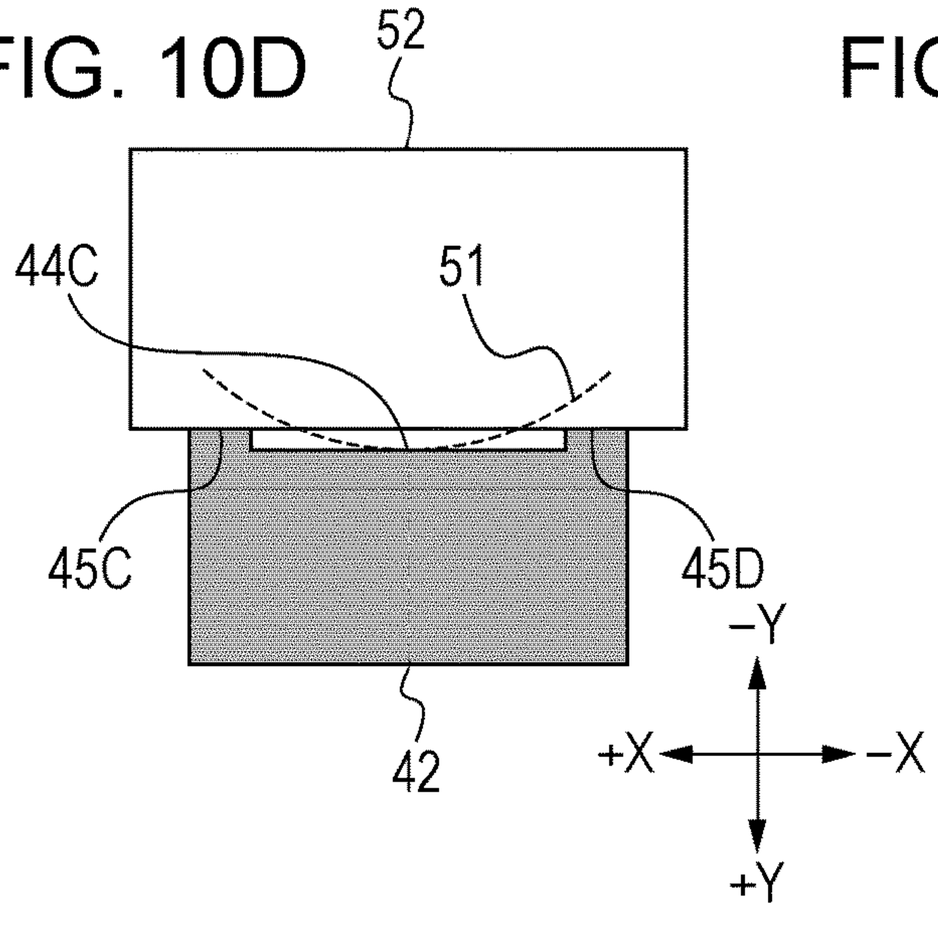



FIG. 10E

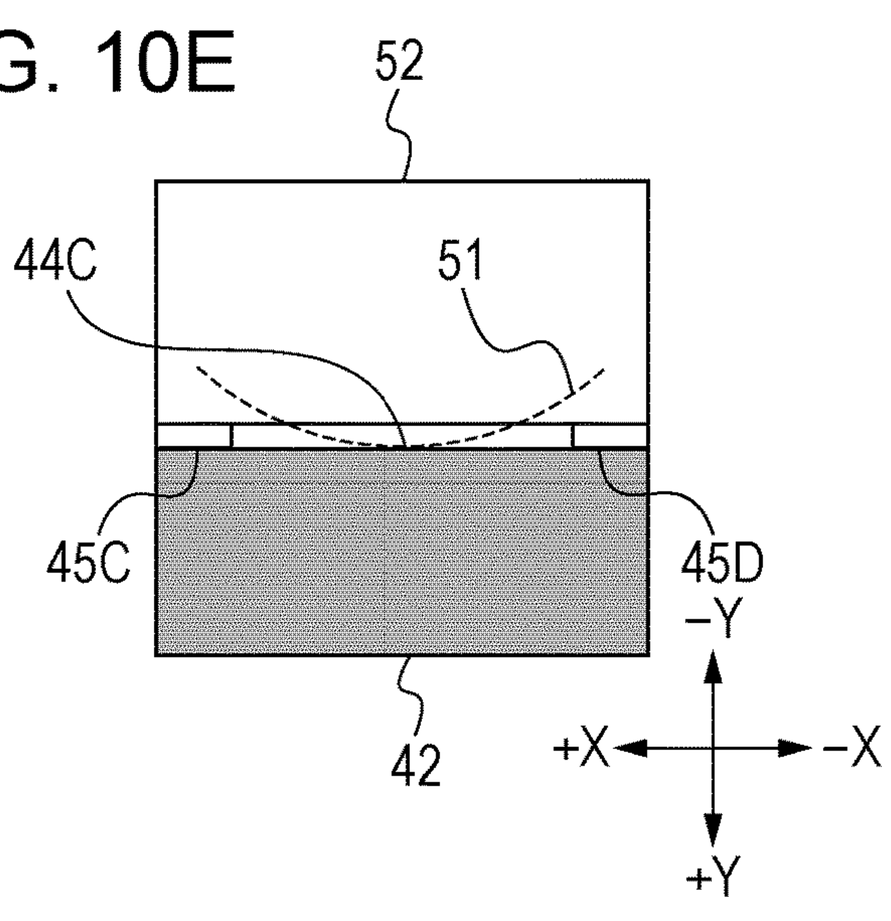


FIG. 11A

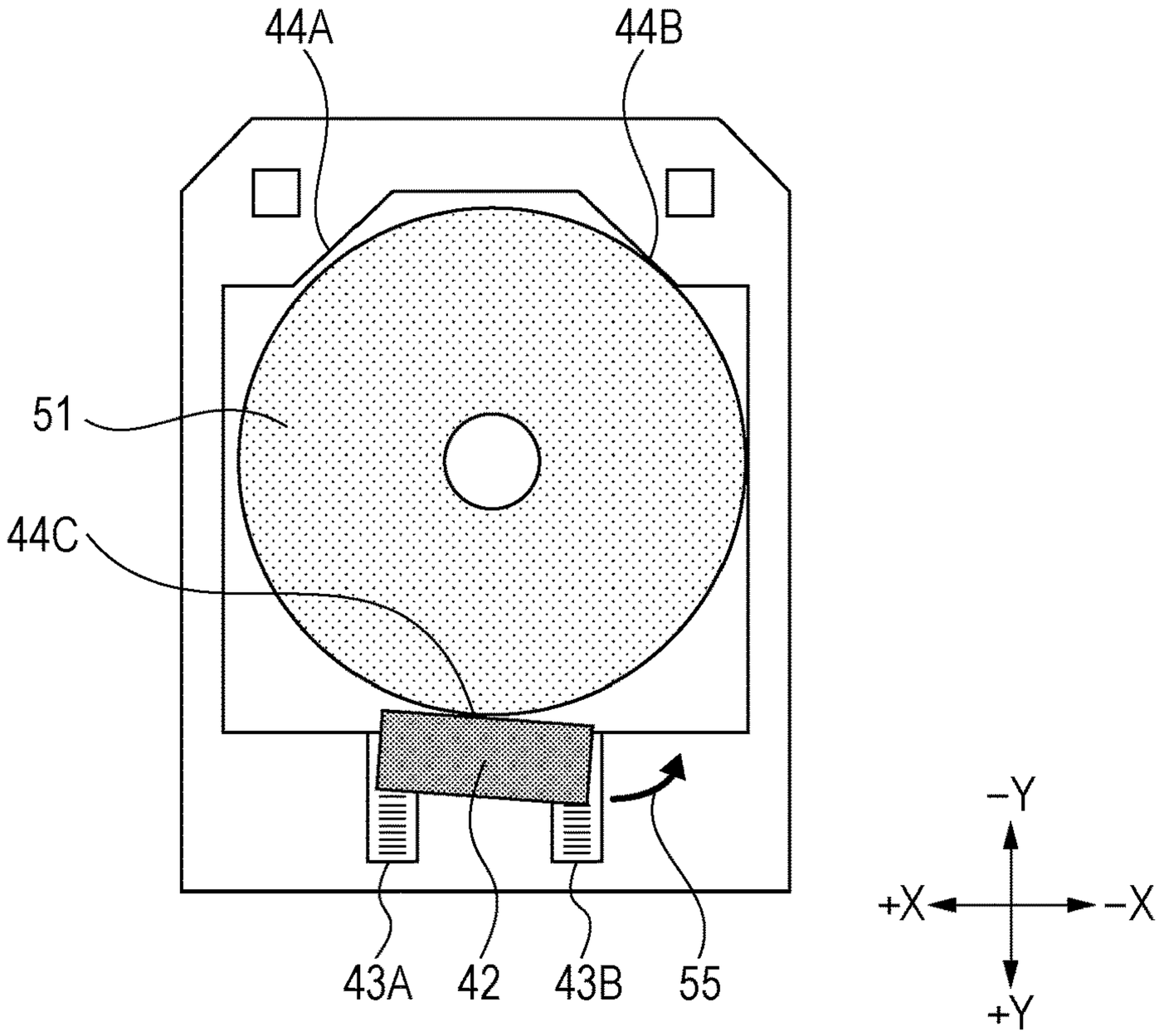



FIG. 11B

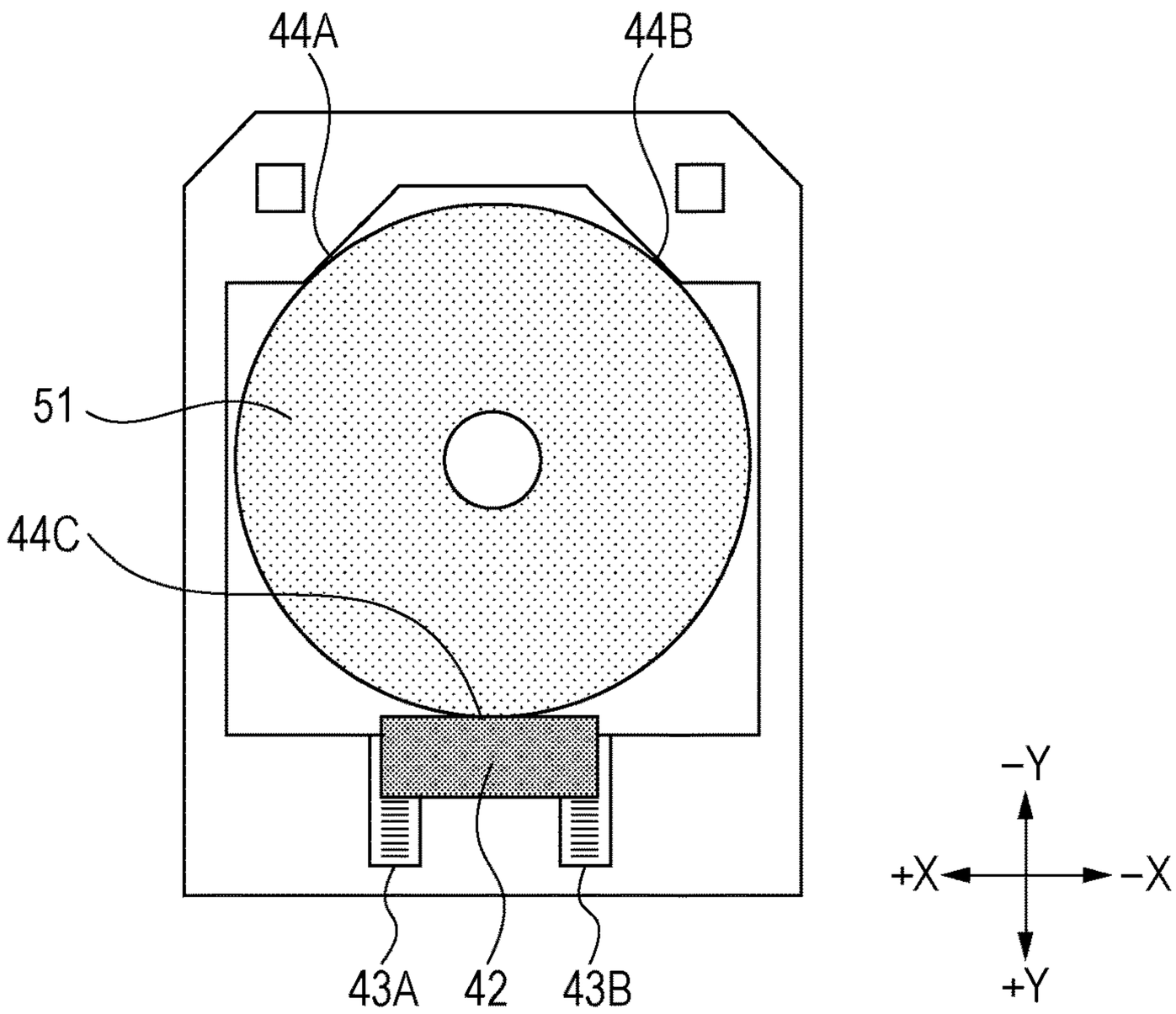


FIG. 12A

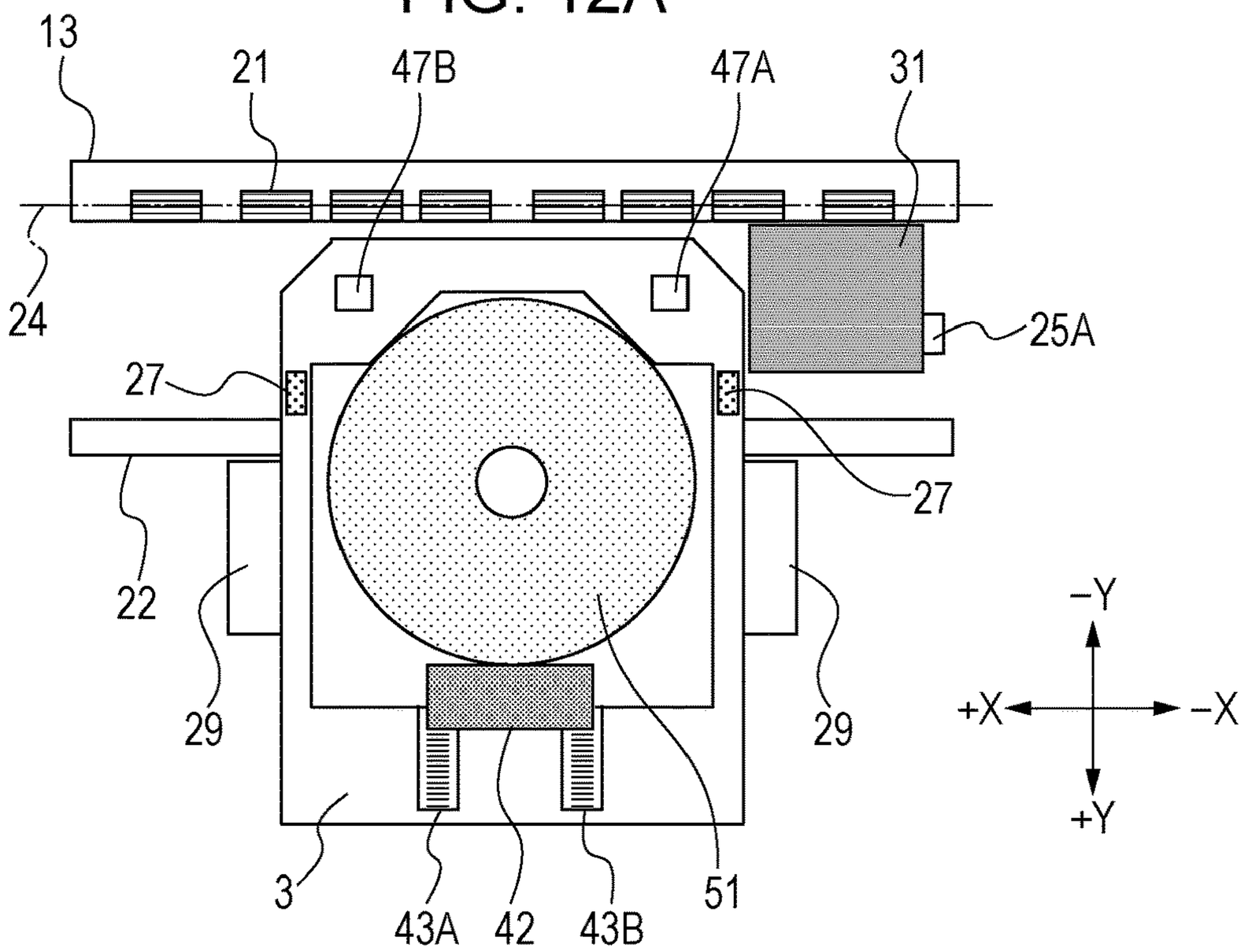
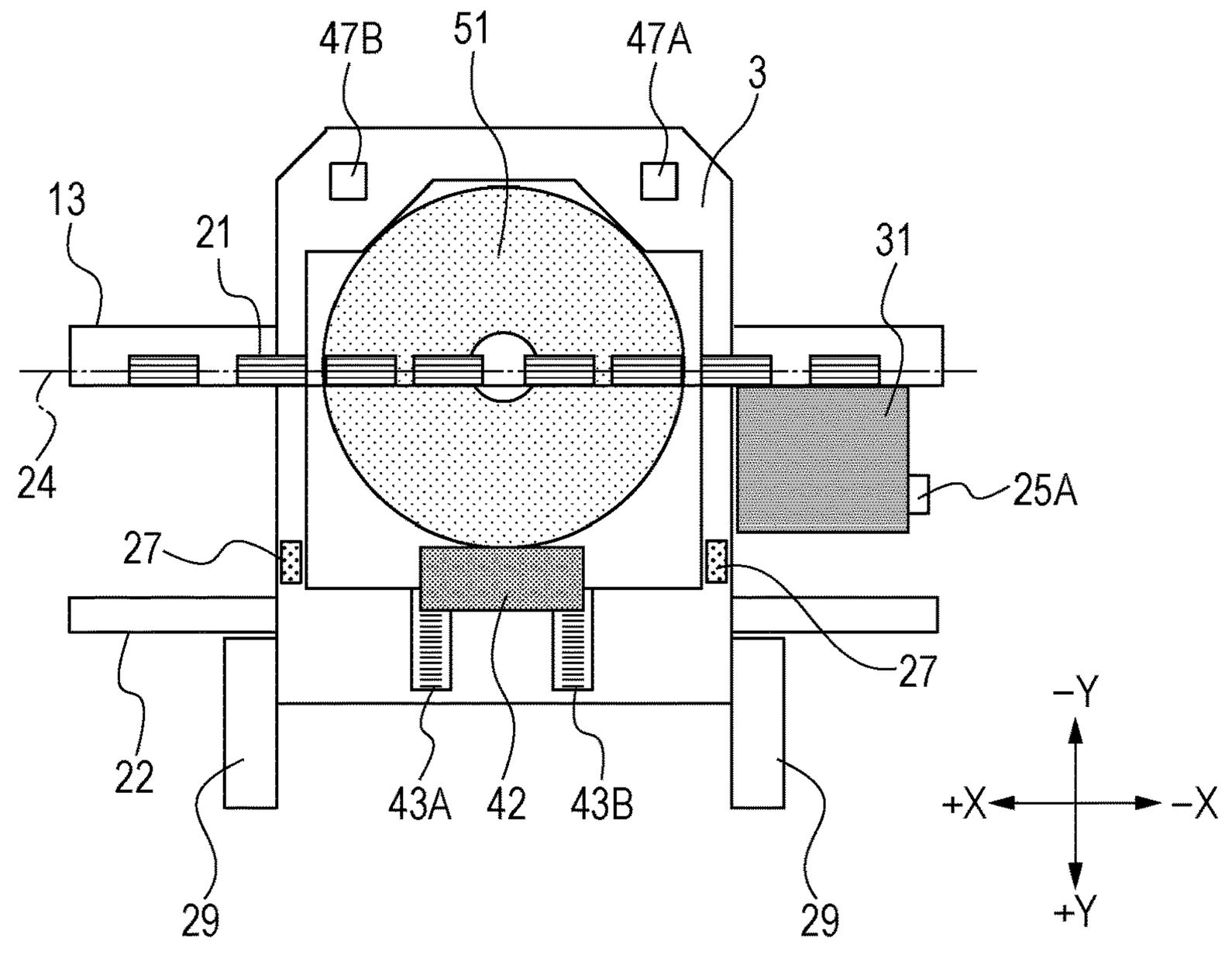



FIG. 12B



# TRAY AND PRINTING APPARATUS

## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to a tray configured to hold a printing medium and a printing apparatus that uses the tray.

### Description of the Related Art

U.S. Patent Application Publication No. 20040141791 discloses a disc transporting tray that has a disc-placement recess. A disc holding unit configured to press a disc towards upstream side in a tray inserting direction with respect to a printing apparatus so as to cause the disc to be in contact with a lower surface of the disc-placement recess.

However, in the configuration according to U.S. Patent Application Publication No. 20040141791, when the printing apparatus is configured such that a tray is held between a roller pair and conveyed, there is a possibility of a disc coming off the tray as a result of the disc holding unit malfunctioning when the disc holding unit is nipped by the roller pair.

## SUMMARY OF THE INVENTION

Considering the aforementioned circumstance, the present invention provides a tray configured to suitably hold a printing medium.

To achieve the above, the present invention provides a tray that is to be used in a printing apparatus that includes a conveying unit configured to convey the tray that holds a printing medium, and a printing unit configured to perform printing onto a print surface of the printing medium held by the tray. The printing apparatus is configured such that a printed material is produced as a result of the printing medium on which printing is performed by the printing unit being taken out from the tray. The tray includes: a placement surface on which the printing medium is to be placed; a pressing member presses the printing medium placed on the placement surface towards a downstream side of an inserting direction of the tray with respect to the printing apparatus; and a regulating portion against which the printing medium pressed by the pressing member is to be abutted.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic perspective view of a printing apparatus according to a first embodiment.

FIG. **2** is a block diagram illustrating a configuration of control of the printing apparatus according to the first embodiment.

FIG. **3** is a perspective view of a tray that is to be used in the printing apparatus according to the first embodiment.

FIGS. **4**A, **4**B, **4**C, and **4**D are schematic top views each illustrating a state in which a printing medium is placed and held on the tray according to the first embodiment.

FIG. **5** is an enlarged top view illustrating a state in which a disc is held by a tray according to the first embodiment.

FIGS. **6**A, **6**B, and **6**C each illustrate a configuration of a regulating portion of the tray according to the first embodiment.



FIG. **7** illustrates a configuration of a regulating portion of a tray of a comparative example.

FIG. **8** is a schematic sectional view illustrating a modification of an inclined surface of a regulating portion.

FIG. **9** is an enlarged top view illustrating a second modification of a regulating portion.

FIGS. **10**A, **10**B, **10**C, **10**D, and **10**E each illustrate a detailed configuration of a pressing member of the tray according to the first embodiment.

FIGS. **11**A and **11**B each describe an equalizing function of the pressing member of the tray according to the first embodiment.

FIGS. **12**A and **12**B are schematic top views describing a printing operation with respect to a disc held on the tray according to the first embodiment.

## DESCRIPTION OF THE EMBODIMENTS

Embodiments of a printing apparatus that uses a tray according to the present invention will be described. Note that components described in the embodiments are presented as examples and do not intend to limit the scope of the present invention. In the present specification, description will be provided by presenting, as an example, a serial-type inkjet printing apparatus that includes a printing head configured to discharge an ink with respect to a printing medium conveyed in an intermittent manner and that causes the printing head to reciprocate in a direction intersecting a conveying direction of the printing medium to perform printing. However, the present invention is not limited thereto and is applicable also to a line-type inkjet printing apparatus that uses a long print head to perform printing continuously. In the present specification, "ink" is used as a generic name of liquids, such as a printing liquid. In addition, in the present specification, "printing" is not limited to printing onto a planar object and includes printing onto a three-dimensional object. In the present specification, "printing medium" is used as a generic name of printing media onto which a liquid is discharged, the printing media including, for example, a paper sheet, a fabric, a plastic film, a metal plate, a glass, a ceramic, a wooden material, and a leather.

### First Embodiment

FIG. **1** is a schematic perspective view illustrating an internal configuration of a printing apparatus **1** according to the present embodiment. The printing apparatus **1** is loaded with a printing head **12** configured to discharge an ink with respect to a printing medium **11** and includes a carriage **31** configured to reciprocate in an X direction. The carriage **31** is guided and supported by a guide shaft **14** so as to be slidable in the X direction. A carriage motor **15** having a pulley is disposed at one end of an area in which the carriage **31** is movable, and an idler pulley **16** is disposed at the other end thereof. A timing belt **17** is stretched around the pulley of the carriage motor **15** and the idler pulley **16**, and the carriage **31** and the timing belt **17** are thereby coupled to each other. A support member **18** that extends parallel to the guide shaft **14** is disposed on the downstream side in a +Y direction to suppress the carriage **31** from rotating about the guide shaft **14**. The carriage **31** is slidably supported by the support member **18**. The X direction is a direction in which the carriage **31** performs scanning and thus is also referred to as a main scanning direction in the following description.

The printing apparatus **1** includes, in the area in which the carriage **31** is movable and in a non-printing area in which

printing operation by the printing head **12** is not performed, a maintenance mechanism **19** configured to perform maintenance of the printing head **12**. The maintenance mechanism **19** includes, for example, a cap for sealing a discharge-port surface of the printing head **12** during a non-printing period, a wiper for wiping foreign materials and an excess ink adhering to the discharge-port surface, and the like. Hereinafter, a side on which the maintenance mechanism **19** is disposed in the X direction is referred to as a HOME side, and a side opposite to the HOME side is referred to as an AWAY side.

The printing apparatus **1** further includes a conveying unit that includes, for example, a first conveyance roller **13** and a second conveyance roller **22** (refer to FIG. **12**) that are driven by a conveyance motor **20**. The first conveyance roller **13** is disposed on the upstream side of the printing head **12** in the +Y direction. The second conveyance roller **22** is disposed on the downstream side of the printing head **12** in the +Y direction. The printing medium **11** is conveyed in the +Y direction, which intersects the X direction, by the conveying unit. In the present embodiment, the X direction and the Y direction are orthogonal to each other.

The printing apparatus **1** repeats a printing operation in which the printing head **12** discharges an ink while moving together with the carriage **31** in the X direction and an intermittent conveyance operation in which the conveying unit conveys the printing medium **11** in the Y direction, thereby printing an image onto the entire of the printing medium **11**. The printing medium **11** conveyed by the conveying unit is supported at a lower surface thereof by a platen **10** that is disposed at a position opposite the printing head **12**.

An edge sensor **26** configured to detect the printing medium **11** is disposed inside a conveyance route along which the printing medium **11** is conveyed by the conveying unit. In the present embodiment, the edge sensor **26** is disposed on the upstream side of the carriage **31** in the +Y direction. The edge sensor **26** may be of an optical type or of a mechanical type.

The printing apparatus **1** can perform printing onto, in addition to a printing medium, such as a paper sheet, a thin plate-shaped printing medium, such as a printable disc (hereinafter referred to as "disc"). To perform printing onto a thin plate-shaped printing medium, a user places the printing medium on a special tray **3** (refer to FIG. **3**) to be held thereon and inserts the tray **3** into the printing apparatus **1** in a −Y direction, which is opposite a normal conveying direction (+Y direction). An optical sensor **25**A configured to detect the tray **3** that is thus inserted by a user is attached to the carriage **31**. The optical sensor **25**A is a reflection-type sensor that includes a light emitter and a light receiver.

To perform printing that uses the tray **3**, a user inserts the tray **3** between the second conveyance roller **22** and a spur and advances the tray **3** to a predetermined position. When the optical sensor **25**A detects the tray **3** inserted to the predetermined position of the printing apparatus **1**, the conveyance motor **20** is driven. In response to the driving of the conveyance motor **20**, the first conveyance roller **13** and the second conveyance roller **22** rotate in a direction opposite the rotation direction for normally conveying the printing medium and convey the tray **3** in the −Y direction to a position opposite the printing head **12**.

The printing apparatus **1** is thus configured to convey both a printing medium, such as a paper sheet, conveyed from the upstream side in the +Y direction and the tray **3** inserted from the downstream side (a side close to the second conveyance roller **22**) in the +Y direction. The −Y direction opposite the +Y direction, which is the normal conveying direction, is a direction in which the tray **3** is inserted by a user and, hereinafter, also referred to as an inserting direction.

FIG. **2** is a block diagram illustrating a configuration of control of the printing apparatus **1**. A controller **400** includes a CPU **401** in the form of a micro-computer, a ROM **403** in which programs and other fixed data are stored, and a RAM **405** that includes an area in which image data is rasterized, a work area, and the like. A host apparatus **410** is an image-data supply source connected to the printing apparatus **1** and may be in the form of a personal computer (PC), an image-reading scanner, a digital camera, or the like configured to perform generation, processing, and the like of image data. Image data, other commands, status signals, and the like are transmitted to and received from the controller **400** via an interface (I/F) **412**.

An operation unit **420** includes a plurality of switches configured to receive an instruction input by an operator. These switches include a power supply switch **422**, a recovery switch **426** configured to provide an instruction to perform a maintenance operation for the printing head **12**, and a registration start switch **427** for a user to input a command when executing a registration mode.

A sensor group **430** is configured by a plurality of sensors for detecting a state of the printing apparatus **1**. These sensors include the optical sensor **25**A loaded on the carriage **31**, the edge sensor **26** configured to detect the printing medium **11** in the conveyance route, and a temperature sensor **434** disposed to detect an environment temperature.

The printing head **12** includes a sub-heater **442** configured to perform temperature control to stabilize ink discharge characteristics and a printing element **402** to be used in printing. The sub-heater **442** is in a form of being formed, together with the printing element **402**, on a substrate of the printing head **12** or a form of being attached to the body of the printing head **12** or to a head cartridge.

A motor driver **450** is a driver configured to drive the carriage motor **15**. A motor driver **460** is a driver configured to drive the conveyance motor **20** that is used to convey the printing medium **11** and the tray **3**.

Next, with reference to FIG. **3**, the tray **3** according to the present embodiment will be described. The tray **3** includes, mainly, a recessed portion **41** as a placement surface formed to be lower than the periphery thereof to allow a printing medium to be placed thereon, a slidable pressing member **42** that presses the printing medium **11** placed in the recessed portion **41**, and elastic members **43**A and **43**B configured to urge the pressing member **42**. The pressing member **42** is urged towards the downstream side in the inserting direction (−Y direction) of the tray **3** by the elastic members **43**A and **43**B. The tray **3** includes a first regulating portion **44** and a second regulating portion **45**, against which a printing medium placed in the recessed portion **41** and pressed (urged) by the pressing member **42** is abutted to perform positioning of the printing medium.

A head driver **440** is a driver configured to drive the printing head **12**. The first regulating portion **44** is disposed at a position that enables, for example, a circular printing medium, such as a disc, to be abutted against the first regulating portion **44**. The first regulating portion **44** includes downstream-side first regulating portions **44**A and **44**B and an upstream-side first regulating portion **44**C. The downstream-side first regulating portions **44**A and **44**B are disposed, on the downstream side of the recessed portion **41** in the inserting direction (−Y direction) of the tray **3**, obliquely in the inserting direction of the tray **3** (or in the

longitudinal direction of the tray **3**) so as to extend along the circular shape of the printing medium. The upstream-side first regulating portion **44**C is disposed at a center portion of the pressing member **42** in the X direction, the pressing member **42** being disposed on the upstream side of the recessed portion **41** in the −Y direction.

The second regulating portion **45** is disposed at a position that enables a quadrangular printing medium, such as a later-described mount (adapter), to be abutted against the second regulating portion **45**. The second regulating portion **45** includes downstream-side second regulating portions **45**A and **45**B and upstream-side second regulating portions **45**C and **45**D. The downstream-side second regulating portions **45**A and **45**B are disposed, on the downstream side of the recessed portion **41** in the inserting direction (−Y direction) of the tray **3**, on the outer side of the first regulating portions **44**A and **44**B in the X direction. Each of the upstream-side second regulating portions **45**C and **45**D is disposed at a corresponding one of two end portions of the pressing member **42** in the X direction, the pressing member **42** being disposed on the upstream side of the recessed portion **41** in the −Y direction. In other words, the pressing member **42** is provided with the upstream-side first regulating portion **44**C, against which a disc or the like can be abutted, between the upstream-side second regulating portions **45**C and **45**D.

FIGS. **4**A, **4**B, **4**C, and **4**D are schematic top views each illustrating a state in which a printing medium is placed and held on the tray **3**. FIG. **4**A illustrates a state in which a disc **51**, as a circular printing medium, is held. Examples of the disc are printable optical discs, such as a CD (compact disc), a DVD (digital versatile disc), and a BD (Blu-ray disc). When the disc **51** is held on the tray **3**, an outer edge of the disc **51** is abutted against the downstream-side first regulating portions **44**A and **44**B and the upstream-side first regulating portion **44**C, and positioning of the disc **51** is thereby performed. When the disc **51** is positioned on the tray **3**, the disc **51** and each of the second regulating portions **45**A to **45**D do not abut on each other.

FIG. **4**B illustrates a state of holding a mount **52** that has a shape corresponding to the shape of the recessed portion **41** of the tray **3** and that serves as an adapter that allows a printing medium to be placed thereon. When the mount **52** is held on the tray **3**, the mount **52** and each of the second regulating portions **45**A to **45**D abut on each other, and positioning of the mount **52** is thereby performed. When the mount **52** is positioned on the tray **3**, the mount **52** and each of the first regulating portions **44**A to **44**C do not abut on each other.

FIGS. **4**C and **4**D each illustrate an example of a printing medium onto which printing is to be performed using the mount **52**. FIG. **4**C illustrates a state in which the tray **3** holds a nail-sticker mount **53** that has a shape identical to the shape of the mount **52** illustrated in FIG. **4**B. The nail-sticker mount **53** is a mount on which a printing surface **54** for a nail sticker is arranged. When the nail-sticker mount **53** is placed on the tray **3**, the printing apparatus **1** is enabled to perform printing for a nail sticker with respect to the printing surface **54**.

FIG. **4**D illustrates a state of holding the mount **52** that includes a card placement surface **59** on which a card as a printing medium is to be placed. The card placement surface **59** is a recessed portion whose level is lower than the surface of the mount **52** and has a shape in accordance with the outer shape of the printing medium (card). For example, a printing medium, such as a card, for which a regular size is prescribed in JIS or the like can be placed on the card placement surface **59**. The depth of the recessed portion of the card placement surface **59** may be determined such that, in a state in which a card is placed on the card placement surface **59**, the surface of the card and the surface of the mount **52** are substantially level with each other. Thus, in accordance with the thickness of a card, a through hole or a non-through hole having a predetermined depth is provided in the mount **52** to form the card placement surface **59**.

To enable borderless printing using the mount **52** and the nail-sticker mount **53** with respect to a printing medium, such as a card or a nail sticker, at least the outer side of the printing medium may be formed by an ink receiving layer. The mount **52** and the nail-sticker mount **53** may be formed of plastic or the like. The nail sticker and the card are examples of a printing medium onto which printing is performed using the mount **52**, and the present invention is not limited thereto.

FIG. **5** is an enlarged top view illustrating a state in which the disc **51** is held by the tray **3**. The disc **51** is abutted by the pressing member **42** against the downstream-side first regulating portions **44**A and **44**B and the upstream-side first regulating portion **44**C disposed on the pressing member **42**, thereby being positioned with respect to the tray **3**. In other words, the disc **51** is positioned with respect to the tray **3** by these three first regulating portions **44**. The downstream-side first regulating portions **44**A and **44**B are configured to abut on the outer edge of the placed disc **51** and are disposed bilaterally symmetrical with respect to the center axis of the placed disc **51** in the X direction. In the present embodiment, the downstream-side first regulating portions **44**A and **44**B are formed by inclined surfaces that each incline to intersect the Y direction and the X direction such that a predetermined angle A is formed by the downstream-side first regulating portions **44**A and **44**B. The angle A can be 90 degrees or more. The upstream-side first regulating portion **44**C is formed to be substantially parallel to the X direction in a state of holding the disc **51**.

The tray **3** further includes a first reflective portion **47**A and a second reflective portion **47**B on the downstream side in the inserting direction (−Y direction). When the tray **3** is inserted into the printing apparatus **1**, the optical sensor **25**A loaded on the carriage **31** detects the position of each of the first reflective portion **47**A and the second reflective portion **47**B in the X direction and the Y direction, which enables the printing apparatus **1** to calculate the position of the disc **51**.

With reference to FIGS. **6**A, **6**B, and **6**C, a detailed configuration of the first regulating portion **44** of the tray **3** will be described. FIG. **6**A is a top view of the tray **3** in a state of holding the disc **51**. FIG. **6**B is a sectional view of the downstream-side first regulating portion **44**A sectioned along the line VIB**1**-VIB**1** of FIG. **6**A in the Z direction.

As illustrated in FIG. **6**B, the downstream-side first regulating portion **44**A is constituted by an abutting surface **61**A against which the disc **51** is to be abutted and an inclined surface **61**B that inclines with respect to the abutting surface **61**A. The abutting surface **61**A has a length that is larger than or equal to the thickness of the disc **51**. The inclined surface **61**B is connected to a surface **61**D of the tray **3** and projects with respect to a print surface of the placed disc **51**. In other words, when viewed from the top, the print surface of the disc **51** is covered by the inclined surface **61**B. An interior angle formed by the abutting surface **61**A and the inclined surface **61**B is a predetermined angle B. The angle B can be 90 degrees or more. A sectional view of the downstream-side first regulating portion **44**B sectioned along the line VIB**2**-VIB**2** of FIG. **6**A is identical to FIG. **6**B, and description thereof is thus omitted.

FIG. **6**C is a sectional view of the upstream-side first regulating portion **44**C sectioned along the line VIC-VIC of FIG. **6**A in the Z direction. The upstream-side first regulating portion **44**C is disposed on the pressing member **42**, and thus, FIG. **6**C corresponds to a sectional view of a portion of the pressing member **42** sectioned along the line VIC-VIC. Similarly to the downstream-side first regulating portions **44**A and **44**B, the upstream-side first regulating portion **44**C is constituted by an abutting surface **62**A against which the disc **51** is to be abutted and an inclined surface **62**B that inclines with respect to the abutting surface **62**A. The abutting surface **62**A has a length larger than or equal to the thickness of the disc **51**. The inclined surface **62**B is connected to a surface **62**C of the pressing member and projects with respect to the print surface of the placed disc **51**. In other words, when viewed from the top, the print surface of the disc **51** is covered by the inclined surface **62**B. An interior angle formed by the abutting surface **62**A and the inclined surface **62**B is a predetermined angle C. The angle C can be 90 degrees or more.

As illustrated in FIGS. **6**A, **6**B, and **6**C, each of the first regulating portions **44** has an inclined surface that overlaps the print surface of the disc **51** when viewed from the top. Thus, during setting of the disc **51** onto the tray **3** by a user, the user first inserts the disc **51** with respect to the downstream-side first regulating portions **44**A and **44**B so as to be slipped from below the inclined surface **61**B and causes the disc **51** to abut against the abutting surface **61**A. Then, after placing the disc **51** in the recessed portion **41** by sliding the pressing member **42** towards the upstream side in the −Y direction against an urging force, the user takes the hand off the pressing member **42**, and consequently, the pressing member **42** slides towards the downstream side in the inserting direction (−Y direction) due to the urging force. As a result of the pressing member **42** sliding, the upstream-side first regulating portion **44**C disposed on the pressing member **42** and the disc **51** abut on each other, and positioning of the disc **51** with respect to the tray **3** is thereby completed.

The tray **3** further includes an opening **46**D (refer to FIG. **6**B) in the recessed portion **41** in the vicinity of the abutting surface **61**A of the downstream-side first regulating portions **44**A and **44**B. In addition, as illustrated in FIG. **6**C, the recessed portion **41** in the vicinity of the abutting surface **62**A of the upstream-side first regulating portion **44**C includes an opening **46**A. Consequently, a clearance in the Z direction for insertion of the disc **51** by a user is increased, which improves operability.

An effect of the configuration of the first regulating portion **44** will be described by using a comparative example in FIG. **7**. FIG. **7** is a perspective top view illustrating an example of an existing tray for disc printing. The existing tray includes a fitting portion **30** at a center portion of a placement surface on which a disc is to be placed. A user fits the fitting portion **30** into a hole at the center of a disc to thereby perform positioning of the disc with respect to the tray. However, there is a possibility of the disc coming off the fitting portion **30** when the user bends the tray, in a state in which the disc is positioned on the tray, such that the tray warps in the directions indicated by the arrows **28**A to **28**D.

The tray **3** of the present embodiment includes the inclined surfaces **61**B and **62**B at the first regulating portion **44**, with which positioning of the disc **51** is performed. Thus, even when the disc **51** attempts to warp in a direction away from the recessed portion **41** as a result of the tray **3** being bent, the disc **51** abuts against the inclined surfaces **61**B and **62**B and is suppressed from further warping. Thus, compared to the existing tray, the tray **3** of the present embodiment improves holdability of the disc **51** and has a configuration that suppresses the disc **51** from coming off the tray **3** easily.

FIG. **8** is a schematic sectional view illustrating a modification of the inclined surface **61**B of the downstream-side first regulating portion **44**A. In the modification, there is provided a cover portion (cover surface) **61**C that is connected to the inclined surface **61**B and projects in parallel to the print surface of the placed disc **51**. The cover portion **61**C is provided, similarly to the inclined surface **61**B described in FIGS. **6**A, **6**B, and **6**C, so as to cover the print surface of the disc **51** when viewed from the top. Consequently, compared to a configuration that includes only the inclined surface **61**B, the disc **51** is further suppressed from coming off the tray **3**, which improves holdability of the disc **51**. In this case, a necessary and sufficient clearance D is provided between the cover portion **61**C and the print surface of the placed disc **51**, which enables the disc **51** to be reliably held regardless of a component tolerance.

FIG. **9** is a schematic enlarged top view of a second modification of the downstream-side first regulating portion **44**A and illustrates the vicinity of the downstream-side first regulating portion **44**A. The hatched portion **61**D is a modification of the abutting surface **61**A illustrated in FIG. **6**B, and the broken line **51**C indicates the outer edge of the disc **51**. A curved portion **61**E indicated by a curved line corresponds to the inclined surface **61**B (or the cover portion **61**C) in FIG. **6**B and has a shape extending along the outer edge **51**C of the disc. Due to the curved portion **61**E (the inclined surface or the cover portion) being thus provided in accordance with the shape of the outer edge **51**C of the disc **51**, holdability of the disc **51** is further improved.

Next, with reference to FIGS. **10**A, **10**B, **10**C, **10**D, and **10**E, a detailed configuration of the pressing member **42** will be described. FIG. **10**A is a top view of the tray **3** on which the disc **51** is held. FIG. **10**B is a sectional view of the pressing member **42** sectioned along the line XB-XB of FIG. **10**A in the Z direction. FIG. **10**C is an enlarged view of the pressing member **42** viewed from the rear side (the side on which a printing medium is not placed) of the tray **3**.

As illustrated in FIG. **10**C, the pressing member **42** is held so as to be rotatable with respect to the tray **3** due to a boss **42**A engaging, so as to be slidable in the Y direction, with an engaging hole **3**A disposed in the tray **3**. The direction of rotation of the pressing member **42** with respect to the tray **3** is the direction indicated by the arrow **28**E in FIG. **10**A. The engaging hole **3**A is formed to be slightly larger than the boss **42**A in the X direction to provide a backlash (refer to FIG. **10**B) so that the boss **42**A is movable also in the X direction in the engaging hole **3**A in accordance with the rotation of the pressing member **42**.

The elastic members **43**A and **43**B are disposed at respective positions in the tray **3** so as to be bilaterally symmetrical to each other with the boss **42**A as the center. The elastic members **43**A and **43**B connect the tray **3** and the pressing member **42** to each other and urge the pressing member **42** in the −Y direction. Consequently, when the disc **51** is not placed at a suitable position, equalization is performed by the elastic force of the left and right elastic members **43**A and **43**B such that the disc **51** is positioned at the suitable position.

FIG. **10**D is a schematic top view illustrating a state in which the pressing member **42** presses the mount **52**. For description, the position of the disc **51** while the pressing member **42** presses the disc **51** is indicated by a broken line in FIG. **10**D. FIG. **10**D illustrates a state of abutting of the mount **52** against the upstream-side second regulating por-

tions **45**C and **45**D. In the pressing member **42**, the upstream-side second regulating portions **45**C and **45**D are disposed with the upstream-side first regulating portion **44**C therebetween. The upstream-side second regulating portions **45**C and **45**D are disposed at respective positions as not to be in contact with the outer edge of the disc **51** indicated by the broken line and each have a shape projecting from the upstream-side first regulating portion **44**C in the −Y direction.

FIG. **10**E illustrates a modification of FIG. **10**D, in which the upstream-side second regulating portions **45**C and **45**D are not formed to project in the −Y direction and in which, instead, an area of the mount **52** against which the upstream-side second regulating portions **45**C and **45**D are abutted projects in the +Y direction.

As described above, to enable the disc **51** and the mount **52** to be placed and held in the recessed portion **41**, which is a placement surface, the tray **3** includes the slidable pressing member **42** and the regulating portions that individually correspond to the disc **51** or the mount **52** pressed by the pressing member **42**. Consequently, printing media of different types are enabled to be placed on the tray **3** without the need to increase the thickness of the tray **3**.

With reference to FIGS. **11**A and **11**B, the equalizing function of the pressing member **42** will be described. FIG. **11**A illustrates a state in which the disc **51** is placed by a user so as to be displaced to the right side of the recessed portion **41**. At this time, the disc **51** does not abut against the downstream-side first regulating portion **44**A of the tray **3** and is not normally positioned with respect to the tray **3**. Therefore, if the user inserts the tray **3** in this state into the printing apparatus **1**, there is a possibility of printing being performed at a displaced printing position.

In such a circumstance, in the tray **3** according to the present embodiment, a load that is stronger than a load applied to the elastic member **43**A disposed on the left side is applied to the elastic member **43**B disposed on the right side, which causes an urging force that resists the load to be generated in the elastic member **43**B. Due to the urging force of the elastic member **43**B, the pressing member **42** moves in the direction indicated by the arrow **55** until the elastic forces of the elastic member **43**A and the elastic member **43**B balance each other. Due to the movement of the pressing member **42**, the disc **51** disposed so as to be displaced to the right side is moved towards the left side and suitably positioned (refer to FIG. **11**B) by abutting against the downstream-side first regulating portion **44**A. Similarly, when the disc **51** is placed so as to be displaced to the left side of the recessed portion **41**, the disc **51** is suitably positioned due to equalization performed by the pressing member **42**.

FIGS. **12**A and **12**B are schematic top views each illustrating a state of a printing operation with respect to the disc **51** held on the tray **3**. The printing apparatus **1** includes, as conveying units, the first conveyance roller **13** and the second conveyance roller **22**. There are provided a plurality of first follower rollers **21** that are disposed at respective positions opposite the first conveyance roller **13** and that are urged by a spring with respect to the first conveyance roller **13**. The printing medium **11** and the tray **3** are held between the first conveyance roller **13** and the first follower rollers **21** and conveyed. A nip formed by the first conveyance roller **13** and the first follower rollers **21** is illustrated as a nip line **24**.

The second conveyance roller **22** is disposed on the upstream side of the first conveyance roller **13** in the inserting direction (−Y direction) and is driven together with the first conveyance roller **13** by the conveyance motor **20**. The printing apparatus **1** further includes a spur (not illustrated) that is urged by a spring with respect to the second conveyance roller **22** and that is configured to hold and convey the printing medium **11**, such as a paper sheet, in cooperation with the second conveyance roller **22**. In addition, separately from the spur, there are provided second follower rollers **27** configured to hold and convey the tray **3** in cooperation with the second conveyance roller **22**. The second follower rollers **27** are disposed at two locations so that the tray **3** is held at left and right ends thereof in the X direction. The second follower rollers **27** are disposed at respective positions such that the conveyed tray **3** is held at portions thereof on the outer side of the recessed portion **41**.

During conveyance of the printing medium **11**, such as a paper sheet, by the second conveyance roller **22**, the printing medium **11** and the second follower rollers **27** do not come into contact with each other. During conveyance of the tray **3** by the second conveyance roller **22**, the spur is lifted by a guide member **29** configured to guide the tray **3** when the tray **3** is inserted by a user, and the tray **3** and the spur thus do not come into contact with each other.

FIG. **12**A illustrates a state in which the tray **3** is inserted in the −Y direction by a user. At this time, the guide member **29** functions as a guide for inserting the tray **3** to a suitable position in the X direction. In other words, the tray **3** is restricted by the guide member **29** from being moved or displaced in the X direction. When the tray **3** is inserted to a predetermined position, the carriage **31** moves, and the optical sensor **25**A detects the reflective portions **47**A and **47**B, thereby detecting the position of the tray **3**.

When the optical sensor **25**A detects the position of the tray **3**, the tray **3** is further taken in in the −Y direction, as illustrated in FIG. **12**B, as a result of the rotation of the first conveyance roller **13** and the second conveyance roller **22** and conveyed to a print starting position at which printing by the printing head **12** is started.

Here, due to the pressing member **42** being disposed on the upstream side in the inserting direction (−Y direction), even when the tray **3** is conveyed to the print starting position, the pressing member **42** is positioned on the upstream side of the nip line **24** in the −Y direction. In other words, the pressing member **42** is not held between the first conveyance roller **13** and the first follower rollers **21** during a printing operation with respect to a printing medium held on the tray **3**. Consequently, the disc **51** is suppressed from coming off the tray **3** as a result of the pressing member **42** malfunctioning by being held between the first conveyance roller **13** and the first follower rollers **21**. When the printing operation is completed, the printing medium is taken out from the tray **3** by a user, and consequently, a printed material is produced.

Such a configuration in which the pressing member **42** is disposed on the upstream side in the inserting direction of the tray **3** and urges a printing medium, such as the disc **51**, towards the downstream side in the inserting direction and holds the printing medium achieves conveyance of the tray **3** that reliably holds a printing medium.

A form in which, after the tray **3** is inserted and taken in in the −Y direction from the front side of the printing apparatus **1**, printing is performed while conveying the tray **3** in the +Y direction has been described as an example; however, the inserting direction of the tray **3** is not limited thereto. In other words, by disposing the pressing member **42** on the downstream side in the inserting direction (+Y direction), the same effect is obtained also in a form in which

the tray **3** is inserted in the +Y direction from the back side of the printing apparatus **1** and in which printing is performed in the +Y direction.

The present invention has been described above by presenting, as an example, a printing apparatus that uses an inkjet system; however, the present invention is also applicable to an image forming apparatus that uses an electrographic system.

In other words, the present invention provides a tray configured to suitably hold a printing medium.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2018-145042, filed Aug. 1, 2018, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

**1**. A tray configured for use in a printing apparatus that includes a conveying unit configured to convey the tray when the tray holds an optical disc, and includes a printing unit configured to perform printing onto a print surface of the optical disc held by the tray, the tray comprising:

a placement surface configured to receive the optical disc;

a pressing member configured to press the optical disc received on the placement surface towards a downstream side in an inserting direction of the tray with respect to the printing apparatus; and

a regulating portion configured to regulate a movement of the optical disc received on the placement surface by abutting the optical disc pressed by the pressing member,

wherein the regulating portion includes a cover surface configured to cover a part of the print surface of the optical disc.

**2**. The tray according to claim **1**, wherein the optical disc is a circular disc.

**3**. The tray according to claim **1**, wherein the regulating portion includes:

an abutting surface against which an outer edge of the circular disc is abutted, and

an inclined surface that inclines with respect to the abutting surface and that covers a portion of the print surface of the circular disc.

**4**. The tray according to claim **3**, wherein the cover surface is connected to the inclined surface.

**5**. The tray according to claim **1**, the tray further comprising an elastic member configured to urge the pressing member towards the optical disc.

**6**. The tray according to claim **1**, wherein the printing unit is a printing head configured to print an image by discharging an ink.

**7**. A tray configured for use in a printing apparatus that includes a conveying unit configured to convey the tray when the tray holds a printing medium, and includes a printing unit configured to perform printing onto a print surface of the printing medium held by the tray, the tray comprising:

a placement surface configured to be capable of receiving one of a first printing medium and a second printing medium whose shape is different from the first printing medium;

a pressing member configured to press the printing medium received on the placement surface towards a downstream side in an inserting direction of the tray with respect to the printing apparatus;

a first regulating portion configured to regulate a movement of the first printing medium by abutting the first printing medium pressed by the pressing member, and

a second regulating portion differing from the first regulating portion and configured to regulate a movement of the second printing medium by abutting the second printing medium pressed by the pressing member.

**8**. The tray according to claim **7**, wherein the first printing medium is an optical disc.

**9**. The tray according to claim **7**, wherein the second printing medium includes a nail sticker.

**10**. The tray according to claim **7**, wherein the second printing medium includes a card which is placed on a card placement surface of an adapter, and the second regulating portion regulates a movement of the adapter by abutting the adapter pressed by the pressing member.

**11**. The tray according to claim **8**, wherein the first regulating portion includes:

an abutting surface against which an outer edge of the optical disc is abutted, and

an inclined surface that inclines with respect to the abutting surface and that covers a part of the print surface of the optical disc.

**12**. The tray according to claim **8**, wherein the first regulating portion includes:

an abutting surface against which an outer edge of the optical disc is abutted,

an inclined surface that is connected to the abutting surface and that inclines with respect to the abutting surface, and

a cover surface that is connected to the inclined surface and that covers a portion of the print surface of the optical disc.

**13**. A printing apparatus comprising:

a conveying unit configured to convey a tray when the tray holds an optical disc; and

a printing unit configured to perform printing onto a print surface of the optical disc held by the tray, wherein the tray includes:

a placement surface configured to receive the optical disc,

a pressing member configured to press the optical disc received on the placement surface towards a downstream side in an inserting direction of the tray with respect to the printing apparatus, and

a regulating portion configured to regulate a movement of the optical disc received on the placement surface by abutting the optical disc pressed by the pressing member,

wherein the regulating portion includes a cover surface configured to cover a part of the print surface of the optical disc.

**14**. The printing apparatus according to claim **13**, wherein the printing unit is a printing head configured to print an image by discharging an ink.

**15**. The printing apparatus according to claim **13**, wherein the placement surface is capable of receiving one of a first printing medium and a second printing medium whose shape is different from the first printing medium, and the tray includes a second regulating portion configured to regulate a movement of the second printing medium by abutting the second printing medium pressed by the pressing member, the second regulating portion differing from the first regulating portion.

16. A printing apparatus comprising:

a conveying unit configured to convey the tray when the tray holds a printing medium; and

a printing unit configured to perform printing onto a print surface of the printing medium held by the tray, wherein the tray includes:

a placement surface configured to be capable of receiving one of a first printing medium and a second printing medium whose shape is different from the first printing medium,

a pressing member configured to press the printing medium received on the placement surface towards a downstream side in an inserting direction of the tray with respect to the printing apparatus,

a first regulating portion configured to regulate a movement of the first printing medium by abutting the first printing medium pressed by the pressing member, and

a second regulating portion differing from the first regulating portion and configured to regulate a movement of the second printing medium by abutting the second printing medium pressed by the pressing member.

17. The printing apparatus according to claim 16, wherein the first printing medium is an optical disc.

18. The printing apparatus according to claim 16, wherein the second printing medium includes a nail sticker.

19. The printing apparatus according to claim 16, wherein the second printing medium includes a card which is placed on a card placement surface of an adapter, and the second regulating portion regulates a movement of the adapter by abutting the adapter pressed by the pressing member.

20. The printing apparatus according to claim 16, wherein the printing unit is a printing head configured to print an image by discharging an ink.

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